Special issue for

CIVIL DEFENCE

Special issue for Civil Defence prepared in co-operation with Civil Defence Health Planning Group, Department of National Health and Welfare, Ottawa.

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FOREWORD

The Canadian Medical Association is performing a valuable service in arranging for the publication of this special issue of its Journal in collaboration with the federal Civil Defence Division. This issue's ten excellent articles on the medical aspects of civil defence, with particular reference to the emergency treatment of mass casualties, have been written by outstanding Canadian physicians in the fields covered. The authors have been in close consultation with the Medical Advisory Panels of the Defence Research Board, the Armed Forces Medical Services, and the Civil Defence Health Planning Group of the Department of National Health and Welfare.

In its development of a responsible and realistic civil defence program, the Federal Government is placing special emphasis on health services. Over the past year and a half, fourteen working parties, comprising more than 100 specialists in various aspects of health action, have developed basic material in civil defence health planning. The articles in this special issue translate some of this material into detailed instructions for physicians and other health workers and thus provide a definitive basis for future training and action in this important area of civil defence activity.

In the event of enemy attack on a Canadian community or of a large peacetime disaster, our first thought must be to rescue the living, care for the injured, and bury the dead. These vital responsibilities cannot be left to chance. Without proper organization, a community would suffer unnecessary casualties through the lack of trained voluntary health workers, the shortage of planned emergency hospital accommodation, and the inability of the professional health workers to co-ordinate their efforts unless trained in civil defence methods.

This special issue of the C.M.A. Journal is a notable step forward in Canada's civil defence program. It will do much to give encouragement to the orderly organization of civil defence health services at the various levels of operation so that the training and skill of Canada's physicians and other professional health workers can be used to the best advantage in time of emergency.

Paul Martin

Minister of National Health and Welfare.

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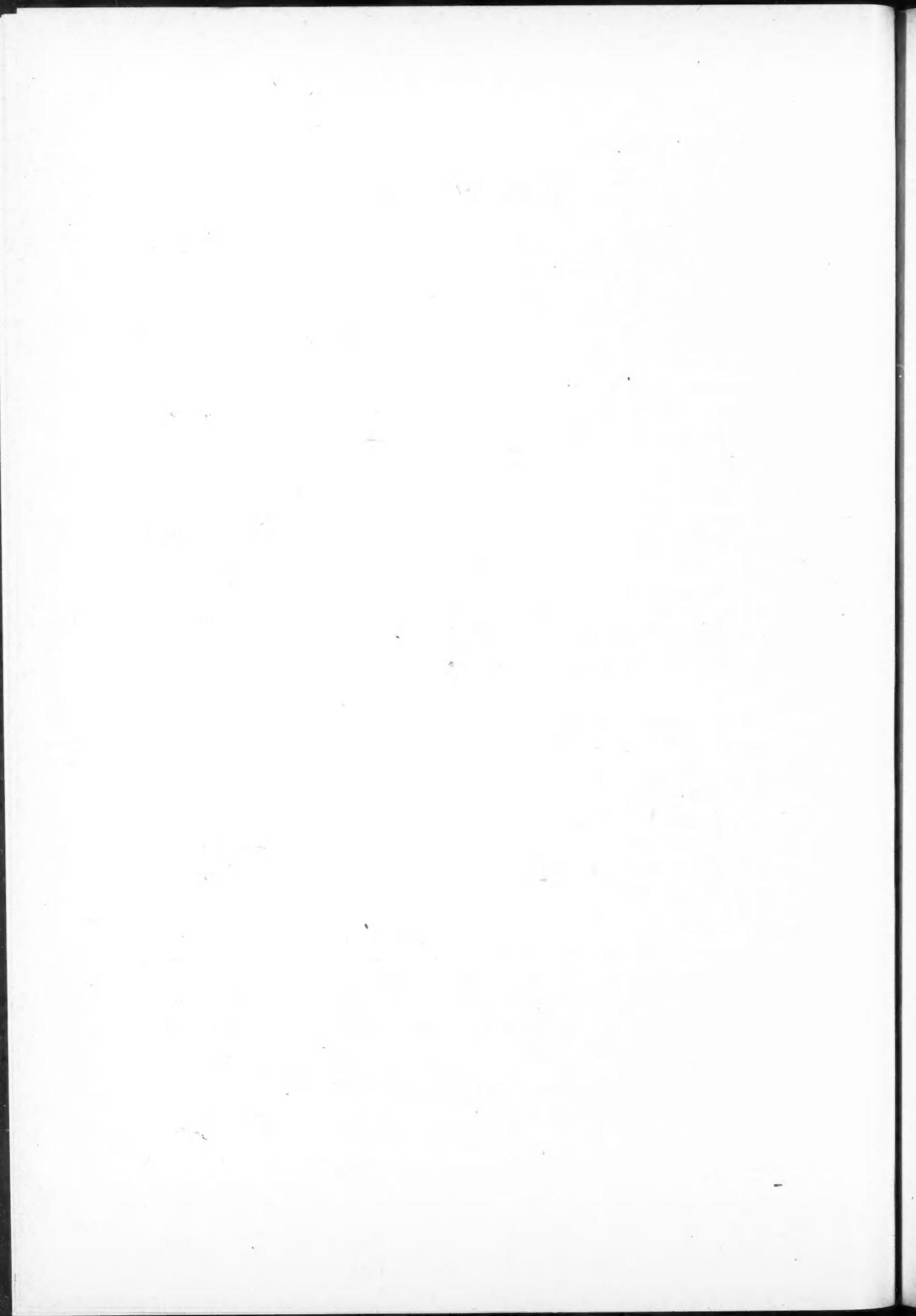
CIVIL DEFENCE
CASUALTY SERVICES

K. C. CHARRON, M.D.*

Civil defence health service plans are based on the concept that if plans are developed for a major disaster and if these are flexible, then the organization will be able to cope with disasters of lesser magnitude. Even the largest metropolitan community in Canada would need considerable assistance to deal with problems created by an atomic burst, and uniformity of basic planning is essential in order to permit effective aid. Plans must be thoroughly co-ordinated at all levels, and civil defence health services must plan and train in peacetime against a wartime emergency.

Although casualty services constitute the largest single civil defence health problem, it must be remembered that there are other extremely important services which must be supplied. These include medical services for critically ill non-casualty cases, restoration and maintenance of public health services, organization of medical supplies, and other preventive and supportive services designed to minimize the health effects of mass disaster. The following article will deal

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with casualty services and is a digest of material prepared by a number of working parties which were set up to develop a general pattern for Canada.

Estimation of Number and Types of Casualties

One of the first steps in planning defence against atomic warfare is the estimation of the potential number and types of casualties, and several variables need to be considered when local estimates are being made. Features such as the density of population in the potential target at different times in the day, whether adequate warning is likely to be received, fire hazards, and the shielding effects of buildings and hills will all affect casualty estimation and must be taken into consideration when local planners are preparing detailed plans for a particular area. Despite these and other variables, it is considered that the overlay principle of estimating casualties will assist civil defence authorities to make a rapid assessment of the situation and to deploy available resources to a disaster area. This overlay principle is illustrated in Fig. 1 and is described briefly as follows:

A series of population density maps is prepared for the area, showing maximum and minimum density hours. Transparent overlays are prepared to the same scale, with a hypothetical ground

OVERLAY FOR ESTIMATING CIVILIAN CASUALTIES IN DISASTER AREA

FOR USE OVER A POPULATION MAP OF THE CITY— OVERLAY MUST BE MADE TO SAME SCALE AS MAP.

(Based on Nominal Bomb)
All Figures Expressed as Percentages Of Total Population Within Each Area.

③ THE OVERLAY IS APPLIED TO THE POPULATION MAP AS FOLLOWS:

ⓐ DETERMINE GROUND ZERO AND PLOT ON MAP.
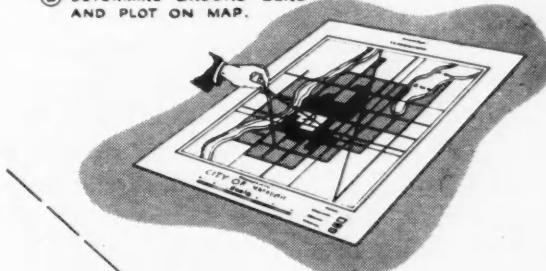
ⓑ PLACE OVERLAY ON MAP, CENTERED ON GROUND ZERO PLOT.
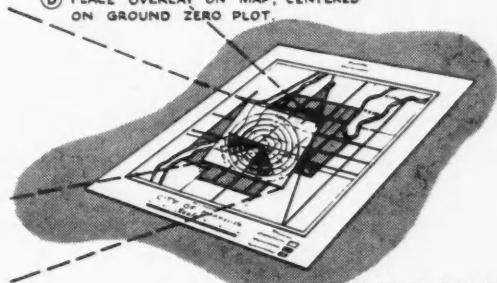
DETERMINE CASUALTIES BY APPLYING OVERLAY PERCENTAGES TO POPULATIONS SHOWN ON MAP UNDER OVERLAY

Fig. 1

zero and concentric circles at one-half mile intervals. Within these circles are percentages indicating casualty percentages with or without warning. These percentages are based on the probable effects of an air burst of a nominal atomic bomb, and tables are available with revised percentages for bombs with a greater TNT equivalent.

Thus the civil defence director would obtain information as soon as possible after the attack as to the approximate location of ground zero and, by applying the appropriate overlay, would be in a position to estimate the probable casualties and the best routes of ingress for first aid and rescue parties. Detailed information received later would permit a more accurate deployment, but this method allows for rapid and effective initial action.

An atomic air burst can cause casualties from blast, heat, and radioactivity. Of the living casualties, it is estimated that about 60 per cent would be suffering from burns, 50 per cent from mechanical injuries, and 20 per cent from radiation. Many would have more than one type of injury, which is the reason that the total is over 100 per cent. One-third would have minor injuries, one-third moderate, and the remainder severe. In an average Canadian city, it is possible that such a burst would cause 40,000 or more casualties and the pattern for civil defence casualty services has been worked out to meet disasters of this magnitude.

First Aid Services (Fig. 2 and 3)

The first aid services would consist of the personnel, equipment and transportation required for: (1) casualty collecting units which provide first aid care in the devastated area and (2) first aid stations set up on the circumference of this area. Each first aid station (F.A.S.) would have three casualty collecting units working with it, and would be designed to handle approximately 1,000 casualties. In addition, the principle of self-help would be stressed and first aid would be available also at warden's posts, welfare centres, and from industries, department stores, and so forth which have set up first aid units as a part of their pre-disaster planning. It is estimated that first aid services might have to deal with 20,000 or more casualties following an air burst of a nominal atomic bomb, and the arrangements suggested are intended for such a situation. It is emphasized, however, that the disposition of first aid services would depend on the type and magnitude of the disaster and arrangements must be flexible to allow for alternate methods of deployment.

Mobilization of First Aid Services

Assembly points should be established outside a potential target area, usually near the outskirts of a city. These assembly points will serve as storage locations for first aid supplies and as meeting points for personnel and transport assigned to the first aid services.

First aid service personnel should proceed to their assigned assembly points immediately after a disaster and alternate assembly points should also be designated. The first aid vehicles would also rendezvous at these points, pick up first aid supplies and personnel, and then be directed to the approximate location of the first aid station. The exact site of the first aid station would be determined in consultation with the local warden service after arrival at the incident site, and control headquarters would then be informed of this location. Casualty collecting units attached to the first aid station would work forward from this site.

Mutual aid area units and mobile support columns should be familiar with the basic pattern for first aid arrangements. They would stop at assembly points on the way to obtain directions concerning their assignment to particular locations. These mobilization plans would have to be integrated with those of other civil defence services and all first aid service personnel must be thoroughly familiar with them.

1. Casualty Collecting Units (C.C.U.) (Fig. 2)

Functions of a Casualty Collecting Unit

The C.C.U. will carry out the following functions:

    (a) Control hæmorrhage,

    (b) Immobilize fractures,

    (c) Apply dressings to wounds,

    (d) Treat burns,

    (e) Relieve pain,

    (f) Initiate record on the emergency medical tag,

    (g) Transport stretcher cases and direct walking wounded to first aid station.

Personnel for a Casualty Collecting Unit

Each casualty collecting unit will have the following personnel, and three units will work with each first aid station.

Unit leader	1
Deputy unit leader	1
Messengers	2
First aiders*	6
Stretcher bearers*	36
	46

*(3 teams with 2 first aiders and 3 stretcher parties of 4 bearers each).

Equipment for a Casualty Collecting Unit

First Aid Kit

Bandage, gauze, compressed, 4″ x 5 yds	ea.	12
Bandage, muslin, triangular, compressed, 40″ x 40″ x 56″	ea.	6
Shell dressing		10

Pins, safety, medium, 12's	card	1
Morphine tartrate syrette, 0.016 (¼ gr.) 1.5 c.c. collapsible tube with needle	ea.	6
Tetracaine ophthalmic ointment 5% ⅛ oz. in tube	ea.	1
Emergency medical tag, 50's	book	2
Pencil, lead, medium, with eraser	ea.	1
Pencil, coloured wax	ea.	1
Scissors, stretcher bearer, 6″	ea.	1
Pouch, canvas, with carrying strap (for first aid kit)	ea.	1
Water bottle	ea.	1

These kits will be issued to the unit leader, deputy leader, first-aiders, and to the senior person in each stretcher team.

Stretchers—1 per team, with blankets—(Pool of 12, with blankets, at C.C.P.).

FIRST AID SERVICES IN DISASTER AREA

Casualty Collecting Unit (C.C.U.)

GROUND ZERO 1 MILE

2 FIRST AIDERS, 12 STRETCHER BEARERS   2 FIRST AIDERS, 12 STRETCHER BEARERS   2 FIRST AIDERS, 12 STRETCHER BEARERS

MESSENGER (BOY SCOUT)   MESSENGER (BOY SCOUT)

Casualty Collecting Post (C.C.P.)

LEADER & DEPUTY LEADER (First Aiders)   12 STRETCHERS

JEEP AMBULANCE PRIORITIES 1,2,3.

C.C.U.   C.C.U.
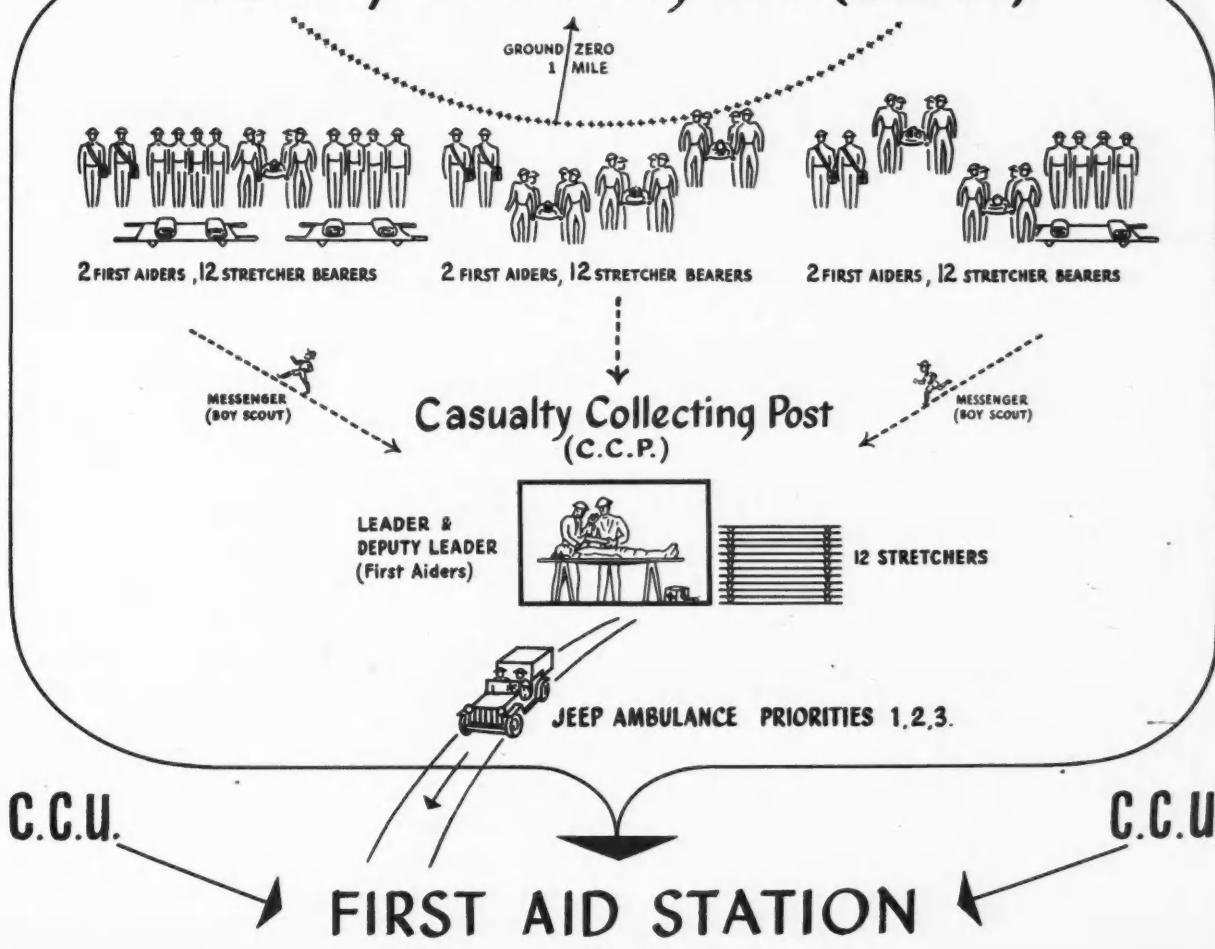
FIRST AID STATION

Fig. 2

Operation of a Casualty Collecting Unit

Three casualty collecting units will be attached to each first aid station and will cover the part of the damaged area considered to be the responsibility of the particular unit. They will work in from the circumference towards ground zero. Damage control officers and others on the spot will supply information on the location and number of casualties likely to be found in the area and assist with the proper deployment of the units. However, the units will be under the direct authority of the physician in charge of the parent first aid station. Each unit will proceed along an assigned route, and the leader of the unit will set up a casualty collecting post (C.C.P.) as far forward as jeeps or other light vehicles at the disposal of the unit are able to proceed. The objective will be to reduce the distance of the stretcher carry to a minimum. The first aid and stretcher teams will fan out from the C.C.P. and examine, treat, and tag casualties. They will work closely with the rescue services and exchange stretchers with that service if stretchers allotted for rescue are used to transport victims. The unit leader and his deputy will operate at and out of the C.C.P. and they will have two messengers at their disposal. A stretcher pool of twelve stretchers, with blankets, will be established at the C.C.P. Walking wounded may be treated in the forward area, at the C.C.P., or be directed to the first aid station.

2. First Aid Stations (Figure 3)

The first aid station units are mobile in the beginning and then take up a static location with the casualty collecting units operating in advance of the fixed station and working closely with it. It is at this level that casualties first come under the care of medical personnel and receive emergency medical treatment.

Functions of a First Aid Station

The functions of these first aid stations will be as follows:

 (a) Control hæmorrhage.
 (b) Immobilize fractures.
 (c) Apply dressings to wounds and burns.
 (d) Triage (screening).
 (e) Treat shock.
 (f) Relieve pain.
 (g) Maintain casualty records.

 (h) Hold casualties (if evacuation cannot be accomplished at once).
 (i) Keep Medical Controller informed.

Personnel Requirements and Staffing Pattern for a First Aid Station

Medical officers	4
Dental officers, pharmacists	3
Nurses	6
Nursing auxiliary and first aid workers	60
Transport officers	3
Clerks	6
Stretcher bearers	50
Canteen worker	1

The above represents the personnel required to operate the first aid station for a twenty-four hour period. In certain target areas it may not be possible to staff fully the first aid stations with local personnel, and in such a case a nucleus group would be provided from local resources and they would rely on mutual aid and mobile support to bring the staff up to full complement.

One of the four physicians should be designated as the Officer-in-Charge of the first aid station and a second named as his deputy. Physicians should screen and sort casualties, direct the treatment of patients and personally supervise the treatment for the most urgent cases.

Dentists should serve as administrative officers and as medical assistants, supervising and carrying out emergency treatment which might include the giving of anæsthetics, venipuncture, and so forth.

Pharmacists in the unit would be particularly valuable in handling supplies and assisting with emergency treatment.

One of the six nurses should be designated as the Nurse-in-Charge. The primary function of nurses in first aid stations would be to supervise the work of auxiliary nursing workers. They might also be called upon to do venipuncture and perform other duties which are ordinarily considered to be beyond the responsibilities of their profession in normal times.

The auxiliary nursing workers should be trained in advanced first aid and/or home nursing. Certain selected individuals should receive training in special procedures, such as giving injections, venipuncture, and other duties which are ordinarily considered to be beyond the experience of this group.

Transport officials would have operational control of the vehicles allotted to the first aid station. They should arrange for a few of the

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lighter vehicles to proceed forward and move casualties from the casualty collecting posts to the first aid stations. The remainder of the vehicles would evacuate casualties from the first aid stations to the emergency hospitals. Transport officers should act as liaison officers between the Medical Officer in charge of the first aid station and the Medical Controller at the sub-divisional control centre.

Clerks would be responsible for records. They should see that the emergency medical tag is completed in the reception area of the first aid station for all casualties. The entry in the first aid station log should also be completed before the casualty leaves the first aid station, and this information should be obtainable from the emergency medical tag.

Stretcher bearers in the unit would assist with the setting up of the first aid station, carry patients, and do other heavy work as required.

The canteen officer would be seconded from the welfare service and should provide hot drinks and other nourishment for both the casualties and staff.

FIRST AID STATION

RECORDS

TREATMENT   HOLDING

P.1

AFTER HOLDING, PRIORITY 1
BECOMES PRIORITY 2.

RECEPTION

TRANSPORT   P.3   P.3   P.2   P.2

COMMUNICATIONS

SUPPLIES   EVACUATION

F.A.S. PERSONNEL
MO's 4
DO's 3
NURSES 6
NURSES AIDS 60
TRANSPORT OFFICERS   3
CLERKS 6
STRETCHER BEARERS   50
+ Additional laboring help
assigned by warden

F.A.S. TRANSPORT EQUIPMENT
5 STAKE TRUCKS (4 stretchers each)
1 BUS (40 passenger)
3 JEEPS
5 PASSENGER CARS

PRIORITY 2's

EXISTING
HOSPITAL

PRIORITY 2's

PRIORITY 3's

IMPROVISED HOSPITAL

AIRPORT,
RAILHEAD,
BUS DEPOT

PRIORITY 2's
POST-OPERATIVE, FIT TO TRAVEL

Fig. 3

Equipment for a First Aid Station

The detailed list of equipment is too long for inclusion in this article. It contains the instruments, drugs, and dressings required for 1,000 casualties and allows for the holding of up to 200 of these for a period of up to 24 hours. However, a few items might be mentioned—plasma, plasma substitutes, and glucose and saline will be provided for fluid therapy; penicillin in oil and oral penicillin as antibiotics; cellulose pads as burn dressings; and Thomas splints, Kramer wire, and plaster of paris for fractures.

Operation of a First Aid Station

It is desirable that all casualties flow through a first aid station (Fig. 3). The casualty is checked in the reception area, the diagnosis made, and classification into one of three priorities is effected.

Priority 1—Cases requiring resuscitation and urgent surgery.

> Severe shock from whatever cause.
> Open wounds of the chest.
> Abdominal wounds.
> Very extensive muscle wounds (calf, thigh, buttocks, axilla).
> Severe open fractures.
> Severe burns.
> Certain multiple wounds.

Priority 2—Cases requiring early surgery and possibly resuscitation.

> Less serious open fractures.
> Multiple minor wounds.
> Less serious amputations.
> Less serious burns.

Priority 3—All other wounded cases.

Walking casualties would be treated and sent to their homes or to rest centres to return, if necessary, for out-patient service. Cases requiring operative and other skilled professional care would be transported immediately, if possible, to an emergency hospital and speed of evacuation would have priority. However, the time lag between the first aid station service and care in an emergency hospital may make supportive treatment necessary at the first aid station for such priority cases. Other less urgent cases may also have to be held at the first aid station until evacuation could be arranged. Plans should be made for the holding of up to 200 casualties for a limited period at each first aid station.

Hospital Services

Hospitals would be the focal points for civil defence casualty services and would be essential for definitive care, particularly for the seriously injured. If an atomic bomb exploded over one of our Canadian cities, at least 20,000 persons would need hospital care and a considerable proportion of these would be seriously injured. It might be possible to evacuate a proportion of the injured outside of the target and mutual aid areas but a large percentage would have to be accommodated within the area and cared for by local hospital facilities which would be of three types:

(a) Existing hospitals which were still usable.

(b) Improvised hospitals set up in suitable buildings.

(c) Hospitals in surrounding areas.

Possible targets in Canada present many variables when hospital potential is being considered. The number of existing hospitals in the community which might be available following an attack can only be determined by a local study of hospitals and their distribution in relationship to the probable target. It is obvious, when thinking in terms of 20,000 persons requiring hospital care, that the majority would have to be treated in improvised hospitals and it would be impossible to furnish normal standards of care.

Existing Hospitals

In the event of disaster, hospital facilities would be reserved only for the most seriously injured. As a first step in meeting the situation, advance arrangements should be made for evacuation of all hospital patients who could be moved on the threat of an impending attack or immediately after an attack. These patients should be discharged to their homes, to centres providing convalescent care, or to remote hospitals. Experience indicates that 75 to 80 per cent of the patients in hospital on any particular day could be evacuated and make room for the seriously injured.

The hospital should determine ways and means to expand to the greatest possible capacity and the average general hospital can be expanded considerably, sometimes to twice or even three times normal capacity. This could be accomplished by using all available space, including conference rooms, classrooms, storage rooms,

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corridors, and other areas. Expansion plans should also include arrangements for using adjacent buildings which are considered suitable for the purpose. However, over-expansion of the hospital should be guarded against, and it must be remembered that the basic facilities and staff should be able to handle the numbers and types of casualties anticipated for the particular unit.

In order to provide for uniform planning, a hospital disaster plan kit has been prepared to assist individual hospitals to set up emergency programs which could be integrated into an over-all hospital disaster plan for all levels. A pamphlet entitled "Hospital Services and Casualty Records" has also been made available to explain the procedure suggested in the kit.

The staffing of hospitals, particularly with professional personnel, would present a major problem and most areas would end up with staff deficits. Arrangements would have to be made for these deficits to be made up from surrounding areas or more distant points. Similarly, plans have been formulated to have essential medical supplies stockpiled on a regional basis in locations where they could be brought rapidly to potential disaster areas.

PREPAREDNESS PLAN

① DESIGNATION OF BUILDINGS
   TO BE USED

② FLOOR PLANS, INDICATING
   NECESSARY ALTERATIONS

③ DESIGNATION OF AREAS OF SPECIFIC
   ACTIVITIES WITHIN BUILDINGS

④ CLINICAL AND ADMINISTRATIVE
   STAFFING PATTERNS
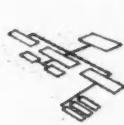
⑤ ESTABLISHMENT OF DUTIES OF
   PERSONNEL

⑥ ESTIMATES OF SUPPLIES AND EQUIPMENT
   REQUIRED, WITH DETAILS OF SOURCES
   AND METHODS OF PROCUREMENT

⑦ ESTABLISHMENT OF RELATIONSHIP
   TO A PARENT EXISTING HOSPITAL

⑧ ESTABLISHMENT OF RELATIONSHIPS
   WITH ALL OTHER CIVIL DEFENCE
   AUTHORITIES AND ACTIVITIES

Fig. 4

Improvised Hospitals

Since existing hospitals would be able to care for only a small fraction of casualties from a major civilian wartime disaster, plans to utilize non-hospital buildings as hospitals must be prepared in advance. The steps in a preparedness plan are illustrated in Fig. 4. In general, it is considered that schools and similar buildings offer the most satisfactory type of structure for conversion to emergency hospital use because they are uniformly distributed, offer a large amount of floor space, have essential facilities such as heat, electricity, hot and cold water, extensive toilet facilities, and, in most cases, lunch rooms and kitchens. They have wide corridors, adjacent playgrounds, and are of one or two storey construction. However, a preliminary survey of each area should indicate the buildings which might be converted into hospitals. This preliminary assessment should be followed by a detailed appraisal of each building by a survey team composed of a hospital administrator, an experienced surgeon, and a hospital matron.

Hospitals in Surrounding Areas

As soon as possible, patients should be transferred from improvised hospitals to nearby or existing hospitals. Local civil defence health service directors should consult with provincial authorities in regard to facilities in other areas that might be used to supplement the hospital resources of the particular community.

Hospitals outside the disaster area might also be expected to provide mobile teams to assist with the staffing of units within the devastated city, and hospital plans have to be flexible to meet this type of situation. An affiliated unit might be composed of twenty members, headed by a unit director. The table of organization might include the following:

1 Chief of Medical Services.
1 Assistant Chief of Medical Services.
6 General Duty Medical Officers.
   (It is considered desirable that at least half of these General Duty Medical Officers have had considerable surgical experience.)
1 Chief of Surgical Services.
1 Assistant Chief of Surgical Services.
2 Anæsthetists.
   (It may not be possible to obtain fully qualified anæsthetists in the numbers

required and this classification also includes physicians with considerable anæsthetic experience.)

8 Nurses.

Affiliated units would be called to duty as required and assigned to existing, improvised, or regional hospitals. The unit described is of convenient size to transport by air. Similarly, small specialist teams might also be needed and plans are being formulated to provide neuro-surgical, maxillo-facial, and ophthalmic groups. Other specialist groups might also be required.

Conclusion

This article describes the pattern for civil defence casualty services in Canada. Emphasis is placed on the need for flexible planning and arranging for adequate mobile support. It is only by a complete mobilization of resources at all levels that we could hope to cope with disasters created by modern methods of war. In addition, any organization built up to meet a wartime necessity would be extremely valuable in coping with any major disaster which might arise in peacetime.

TREATMENT OF WOUNDS, BLAST AND CRUSH INJURIES

A. D. McKENZIE, M.D., F.R.C.S.[C.]*

Mass casualties on the civilian front create problems similar to those on a military front. The considerations which must be kept in mind are the same:—

1. Save life.
2. Preserve function.
3. Restore appearance.
4. Early rehabilitation.

Care of the patient calls for his safe extrication from the insecurity and confusion of the disaster area to a safe area where medical care can be organized, namely, an emergency hospital.

Wound treatment will be considered in three areas: Disaster, Lines of Evacuation, and Emergency Hospital, under these headings:—

1. Disaster Area.
   (a) First Aid fundamentals.
   (b) Evacuation.
2. First Aid Stations.
   (a) Triage and evacuation.
   (b) Temporary function as emergency hospital.
3. Emergency Hospital.
   (a) All wounds.
      (i) shock.
      (ii) infection—antibiotics, tetanus, gas gangrene.
      (iii) wound surgery.
   (b) Specific wounds.
      (i) peripheral nerve injuries.
      (ii) arterial injuries.
      (iii) head injuries.
      (iv) spinal cord injuries.
      (v) chest injuries.
      (vi) abdominal injuries.
      (vii) eye injuries.
      (viii) maxillo-facial injuries.
   (c) Blast Injuries.
   (d) Crush Injuries.

1. Disaster Area

First Aid workers and rescue teams perform First Aid, briefly document the patients, and promptly evacuate them through casualty clearing units to the First Aid stations. The workers will be equipped with bandages and dressings of the familiar type: the first field and shell dressing of World War II, morphine in syrettes, stretchers, and emergency medical tags. With this armamentarium they will execute fundamental First Aid only:

1 *Arrest Hæmorrhage.* Usually a firmly applied dressing suffices. Rarely will the application of a tourniquet be necessary, and their use is to be discouraged in the light of past unfortunate experience. More limbs have been lost than saved through the imprudent use of tourniquets.

2 *Insure an adequate airway and respiratory exchange.*

   (a) *Maxillo-facial and head wounds.*
   These are often complicated by lingual or other obstructions to the airway. Head cases are subject to emesis and aspiration. The prone or lateral semi-prone position for transport in these cases often clears the pharynx and reduces the risk of obstruction or aspiration.

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(b) *Sucking chest wounds*. Interfering as they do with respiratory exchange these may lead to death or aggravation of shock. Simple closure with a shell dressing or adhesive plaster is recommended.

3 *Immobilize Fractures*. (This is to be considered in a separate contribution).

4 *Provide a sterile cover for open wounds*.

Though all wounds are initially contaminated, secondary contamination can be thus reduced or obviated. Wound dressing also aids in immobilizing the damaged tissue, lessening further trauma, and reducing the shock potential of the wound.

5 *Relieve pain and provide reassurance*.

Though morphine has been liberally used in the past, it is not without its risks. Head injuries notoriously tolerate morphine poorly as existing respiratory depression is aggravated. It is less well known that such depression in any wounded patient may complicate resuscitation. Many wounded suffer less from pain than from anxiety, and are as much benefited by reassurance and comfort as by morphine. Finally, subcutaneous morphine is slowly absorbed from the interstitial tissues of the shocked patient and repeated dosage may lead to a serious accumulation with lethal effect when shock is combated. The use of morphine judiciously and in moderation is recommended.

6 *Insure the comfort and warmth of the patient*. Regard for the comfort of the patient on the stretcher, such as loosening constricting clothing, removing prodding possessions, securely tucking the patient on the stretcher, pays dividends in reassurance and reducing shock. Though active heating is not usually desirable, the prevention of a chill is. A blanket beneath the patient as well as over is essential.

7 *Documentation*.

The name and address of the casualty should be recorded and also the location where injured and date and hour tagged. In certain circumstances the agent of wounding should also be named. Special wounds require further notes, as in head or spinal cord injuries.

2 First Aid Stations

Forward of the First Aid Stations, evacuation and First Aid are the only considerations. At the First Aid Stations is added the need for casualty sorting or triage; and on occasion these Stations function as emergency hospitals or holding units. Triage is an evaluation of casualties and their classification in three principal groups which will govern their subsequent handling:

1 Those who can continue along the lines of evacuation without further attention.
2 Those who require immediate resuscitation.
3 Those who require high priority evacuation for surgery.

All patients will be checked for the comfort and adequacy of their First Aid treatment. The moderately or severely wounded will be given penicillin. Some casualties will have resuscitative measures instituted, the number varying with the adequacy of the lines of evacuation. On occasion, simple urgent surgical procedures can be carried out. Choked lines of evacuation or confusion may necessitate the First Aid Station acting as a holding unit for some 24 hours until improvement in conditions occurs. Being medically staffed and equipped, it is able to so function and carry out urgent resuscitation and surgery.

3 Emergency Hospital

(a) *All wounds*

Successful treatment of all wounds calls for combating shock, controlling infection, and conforming to certain fundamental surgical procedures.

(i) *Shock* is controversial in definition, etiology, and treatment. Certain facts can be enumerated which are useful guides.

(1) Wound shock is usually the result of decreased blood volume, and this is most commonly a whole blood deficit.

(2) Shock is aggravated by wounds which interfere with the oxygenation and circulation of the blood, for example: a chest wound, cardiac tamponade, respiratory obstruction.

(3) Continuing pain and tissue trauma aggravate the shocked state.

(4) The presence of traumatized, contused, or ischæmic tissue and infection render shock refractory to treatment.

Effective anti-shock measures thus include:

(1) Arrest of blood loss and restoration of blood volume.

(2) Correction of physiological disturbances.

(3) Immobilization of fractures and wounds to relieve pain and eliminate additional tissue trauma.

(4) Prompt evacuation, early wound excision, and anti-bacterial measures.

Of these measures, only the restoration of the blood volume will be discussed. The other principles will be covered under their own headings.

It is generally agreed that compatible, whole blood is the agent of choice in the treatment of wound shock. Only whole blood provides hæmoglobin, antibodies, proteins, and osmotic pressure components desired. In mass casualty treatment, proven Group O blood would be given in the immediate post-disaster period and later group specific blood would be used. Human blood derivatives as concentrated serum albumin or plasma would be next choice. Finally, a wide variety of "extender substances" have been investigated with a view to their suitability as emergency osmotically effective substances. Dextran and PVP (Polyvinylpyrrolidone) are considered the most suitable of these. They have obvious deficiencies as regards hæmoglobin and protein replacement, and further have certain innate disadvantages. Dextran has occasionally had severe allergic effects. It also complicates the cross-matching of blood. PVP affects the sedimentation rate and its metabolic rate is likewise unknown.

Some principles of blood volume restoration in mass casualties are worthy of enunciation:

(1) When significant blood loss (⅓ or more of blood volume, i.e., 1,500 c.c. or more) has occurred by either history or clinical evidence, transfusion is indicated. Prevention of shock is more successful than resuscitation.

(2) Laboratory aids (hæmoglobin and hæmatocrit) are not of much value in determining the need for transfusion.

(3) Clinical judgment determines when adequate transfusion has been given. A systolic blood pressure of 90 or better, a falling pulse rate, and warm skin are good indicators. Excessive transfusion is to be avoided.

(4) Whole blood is the safest and most effective agent. Blood components, plasma and serum, are the next choice. Plasma extenders (Dextran and PVP) may be necessary where there is a shortage of blood. The use of plasma will be guided by future success in the control of homologous serum jaundice. Experience in the Second World War indicated that where whole blood was in short supply and plasma had to be relied upon to a large extent, an average of one bottle of blood had to be given for each two bottles of plasma.

(5) Administration of blood and blood substitutes will probably not be practical at disaster levels. As the first resuscitation is the most successful, such efforts are best restricted to a level where definitive surgical treatment will be soon available. An occasional case will require transfusion along the lines of evacuation or at the First Aid station, and such cases are usually speeded, with their infusion running, to a centre where surgery is available.

(ii) *Infection:* Prophylaxis and control of wound infection are of great importance in the care of the wounded. Such measures as sterile coverage of the wound to prevent secondary contamination, antibiotics, anti-tetanus and gas gangrene therapy, and sound wound excision are all of importance.

Antibiotics:

Penicillin is still the antibiotic of choice in that it is highly effective and minimally toxic. A prophylactic injection of an oily suspension (300,000 Units Procaine Penicillin G; 100,000 Units Crystalline G) should be administered at the earliest practical level, usually the First Aid station. This will have a bacteriostatic effect against the common pyogenic organisms for 48 to 72 hours. Oral penicillin (500,000 Units per tablet, q.4 h.) is a useful alternative where condi-

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tions or supplies do not permit the injectible form. Therapeutic penicillin both in the Procaine and Crystalline type will be available in emergency hospitals. The latter will be specially useful for massive dosage and local administration (pleural, synovial, intrathecal).

Streptomycin (ordinary or dihydro) is not recommended for mass usage. It is of limited effectiveness and has a significant degree of toxicity. In wounds infected with Gram negative or penicillin-resistant Gram positive organisms (commonly abdominal or perineal wounds), it may be administered in dosage of one gram per day, preferably in two doses. Emergency hospitals only will be supplied, and usage will be restricted to specific indications.

Aureomycin, *Terramycin*. These are oral antibiotics of wide antibacterial spectra and are not recommended for routine usage. Adequate supply for such a purpose is not guaranteed, and sufficient side reactions and toxic effects are known to justify restraint. Emergency hospitals will use these agents as indicated for mixed or penicillin-resistant infections. One gram in four divided doses taken with food is usually effective but larger doses may sometimes be indicated. Limited supply of intravenous aureomycin or terramycin will be available for use when oral intake is impractical or intensive therapy is desired.

Polymixin and *Bacitracin*. Hospitals only will use these agents as supplements to the above where resistant organisms are the indications.

Sulfonamides will find occasional use where antibiotics are either not tolerated or ineffective. Local application in wound therapy is inadvisable.

Anaerobic Infections:

Tetanus. All wounded should receive prophylactic anti-tetanus treatment. Ideally, tetanus toxoid would have been given and would simply require reinforcement to be effective. The civilian population is unlikely to have been so prepared, and anti-toxin administration (1,500 to 3,000 Units) is advised early and at 7 to 10 day intervals subsequently until the risk of anaerobic infection is considered to be past. For practical purposes at least three weekly injections should be given to those not having been actively immunized with tetanus toxoid. Careful watch for the development of tetanus and its aggressive treatment is mandatory. Surgical treatment follows the line of good wound surgery.

Gas Gangrene. Consideration of gas gangrene underlines the importance of rapid evacuation and adequate wound surgery. Notorious for developing gas gangrene are lower extremity wounds, especially if complicated by ischæmia of vascular injuries or shock. However, all wounds are potential candidates as most are contaminated with clostridia. The few which develop clinical gangrene provide a suitable pabulum for anaerobic bacterial growth. Such a pabulum is provided by ischæmic tissue be it from devitalization, vascular injury, persistent shock, injudicious use of tourniquets, or retained foreign bodies.

Prophylaxis of gas gangene is, basically, early and good surgery. Anti-toxin is sound in principle when the wound is potentially a subject to clostridial infection. Doses based on at least 9,000 units of Welchii Antitoxin in a polyvalent serum are given daily. Toxoids are still the subject of bacteriologic investigation. Antibiotics, both clinically and experimentally, have proved valuable in prophylaxis, and a prophylactic injection of the oily suspension of penicillin (300,000 units Procaine Penicillin G in 1 millilitre with 100,000 units Crystalline G) should be administered.

Active therapy of gas gangrene must be instituted at the earliest suspicion of its presence. Close observation of the patient and a knowledge of the signs and symptoms are essential. Though the period of incubation may be as brief as hours or as long as years, it is most commonly one to six days. The patient may show apathy and anorexia, even stupor, while the pulse is elevated out of proportion to the temperature. Pain developing in the wound site is an early and frequent complaint. Local signs include tension, œdema, discoloration, dark discharge and crepitation. Until proved otherwise, a combination of some of these findings calls for a bacteriologic study of the wound and prompt institution of treatment without awaiting the laboratory report.

In treating established gas gangrene good wound surgery is still basic. Anti-toxin, to be beneficial, must be given prodigally. A dose based on 27,000 Units of Welchii in a polyvalent serum is given intravenously and repeated q.4.h. until surgical and antibiotic control is established. Antibiotic administration is likewise heroic. Crystalline Penicillin 1,000,000 units q.4.h. is recommended (broad spectrum antibiotics have

also been recommended and may be useful in doses of 500 milligrams intravenously every eight to twelve hours). Other measures to combat anoxia such as transfusion or oxygen therapy are essential adjuncts.

(iii) *Wound Surgery*: Experience in two World Wars that wound surgery, to be safe, must be staged, is receiving confirmation currently in Korea. The first stage, WOUND EXCISION, is a task of emergency hospitals and emergency surgical teams. The second stage, WOUND CLOSURE, or delayed suture, is better performed at stable units where patients can be held. Stage one only will be covered in this paper. Nine of ten wounds can be treated by this method, and nine of ten of those so treated will heal promptly. Primary suture abetted by anti-biotics—so tempting in its possibilities—is not recommended except for unusual wounds, un-usual circumstances, or the very unusual surgeon. Delayed suture used in mass casualties under emergency conditions by a variety of personnel has set a high standard of safety and success. Contributing to the success of wound surgery are sensible First Aid, prompt evacuation, anti-biotics and resuscitation. The particular part played by each of these has been mentioned but bears reiteration:

> *First Aid* can save life or limb, reduce shock, and prevent secondary contamination.
>
> *Prompt evacuation* permits early wound surgery, and only early surgery carries a high degree of success.
>
> *Antibiotics* have lowered the incidence and risk of wound infection, but alone do not guarantee safe wound healing.
>
> *Resuscitation* has salvaged and prepared many for surgery but it is no talisman against the noxious influence of ischæmic muscle and infection.

It is apparent, then, that the essence of success is early, adequate, and intelligent surgery. The principles of good primary wound surgery have been long established and remain unaltered. The wound environs should be prepared with soap and water or C.T.A.B. and shaved. The skin is marginally excised only as it is of great vitality. Longitudinal extension of the wound is frequently necessary to exposure and should be liberal. Underlying tissues—fat, fascia, and muscle—frankly necrotic or of precarious via-bility are freely and widely excised until a healthy bed of tissue is reached. Foreign bodies (in parti-

cular, ragged splinters or bits of clothing) should be sought and removed with the aid of preli-minary x-rays. Only bony fragments derived of periosteal attachment are removed. Tension and pockets are averted by free fascial incision both longitudinal and transverse. The neuro-vascular bundle must not be damaged. A mini-mum of ligatures of fine, absorbable material and no sutures are used. Dry fine mesh gauze dressing—not a packing—just adequate to keep the wound edges separate is inserted and secured by firm compression. Immobility is insured by suitable splinting or plaster casts where applic-able. The large majority of wounds so prepared can be successfully sutured in five to seven days.

(b) Specific Wounds

(i) *Peripheral nerve injuries*: The primary suture of nerves in mass casualties has generally been unsuccessful. No attempt at repair is advised until the wound is well healed—about 3 to 4 weeks. It is important that clinical or surgical evidence of nerve injury be recorded. Prevention of deformity through judicious splinting and preservation of function through physiotherapy are important to success when the suture is finally performed.

(ii) *Arterial injuries*: The saving of life takes pre-cedence over the saving of a limb or a vessel, and thus the arrest of hæmorrhage is a prime consideration. Compression or direct ligature is preferable to a tourniquet. Limb preservation is aided by lowering the metabolic requirements through cooling to room temperature and pre-serving or augmenting collateral circulation. Care of the collaterals can be practised in postur-ing the patient, dressing the wound without encircling bandages, and in wound excision. Sympathetic blocks or sympathectomy have a place in favourable circumstances. Blood vessel repair, anastomoses, and grafts have had limited application in the common badly lacerated wound, but hold promise for simpler wounds treated under favourable circumstances.

(iii) *Head injuries*: These call for a careful inspec-tion to determine their severity. Both on this score, and also to lower the risk of sepsis, the hair should be clipped and shaved about the wound. The unconscious patient must be evacuated prone or semi-prone to prevent asphyxia and aspiration. Careful records of the level of consciousness, pulse, blood pressure, and neurological signs should be kept from the

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initial filling of the medical documents. Deterioration in signs may indicate hæmorrhage and the advisability of early surgery. Head wounds generally stand transport well and can be delivered to a specialist. If this is impractical or surgery is urgent, the general principles of wound treatment with emphasis on scalp closure to prevent infection apply.

(iv) *Spinal cord injuries*: These must be clearly labeled to enable attention to the care of the skin and bladder. From the outset, paralyzed patients must be frequently changed in position and pressure points protected. Emergency relief of bladder distension in forward areas is most safely attained by needle aspiration. Suprapubic cystotomy at Emergency Hospital level is still the safest general rule for bladder control.

(v) *Chest injuries*: Many chest wounds such as a simple perforation or penetration require no special attention. Complicated chest wounds may need urgent attention and should be anticipated. Some of these complications are:

(a) *Sucking open wounds.* These have a profound effect on respiration and circulation. Early closure is necessary. In the field, a large dressing will suffice, while excision and suture are indicated at Emergency Hospital level.

(b) *Unstable chest wall.* This may be either an open or closed injury, but a flexible rib cage moves in a paradoxical fashion, seriously reducing respiratory capacity. Inability to clear secretions further aggravates this state. Stabilization of the chest wall by adhesive plaster or sand bags, control of pain, suction and oxygen are required.

(c) *Hæmorrhage.* All chest wounds must be watched for fluid accumulation, respiratory embarrassment, or shock which might indicate persistent bleeding. Collected blood must be aspirated as it collects. Continued or rapid bleeding may need thoracotomy.

(d) *Hæmopericardium.* The classical signs of shock, a small quiet heart and increased venous pressure are well kept in mind. Aspiration may be lifesaving but reaccumulation of blood calls for early thoracotomy and high priority evacuation.

(e) *Tension Pneumothorax.* Chest tympany and respiratory embarrassment are the signs of a cumulative pneumothorax. Dramatic relief is obtained through a water sealed needle inserted in the second intercostal space anteriorly.

(f) *Associated abdominal injury.* Diagnosis of this complication is difficult as marked abdominal signs may be present without an abdominal injury, or minimal signs may be present with an abdominal injury. Careful observation of progress and good judgment are essential. Associated abdominal injury makes surgery urgent and raises the evacuation priority.

(vi) *Abdominal Injuries*: Intra-abdominal trauma must be suspected not only with open but also with closed abdominal injuries, thigh, pelvic, and chest wounds. A flat x-ray plate of the abdomen at the earliest available opportunity is often helpful. Abdominal visceral injuries are top priority as they travel poorly and are a resuscitation problem. In treating abdominal wounds among mass casualties a more conservative approach is necessary than holds in civilian practice. Space does not permit dealing with individual wounds, but the rule is early conservative surgery.

(vii) *Eye Injuries*: This subject is dealt with in another article of this issue entitled "Emergency Eye Injuries" by Dr. Clement McCulloch and will not be considered here.

(viii) *Maxillo-facial Injuries*: Several practical points are worthy of note:

(a) *Airway.* This may be prejudiced when there is lingual, mandibular, or neck trauma. Tracheotomy may be life saving. A prone or semi-prone position in evacuation is frequently important.

(b) *Vascularity of tissues.* This renders hæmostasis very important as considerable blood loss can occur. Ligation of bleeding points is often necessary. Occasionally even ligation of the external carotid is indicated. This vascularity spells a high degree of viability and resistance to infection which permits conservatism in wound excision and more frequent primary suture.

(c) *Exposed bone*: Bone should be covered by skin or mucosa wherever possible to prevent osteomyelitis.

(c) Blast Injuries

Blast injuries of a direct type result from the positive pressure phase of a shock wave and may cause injury to lungs, stomach, intestines, or nervous sytem. These injuries are particularly noted with high explosive bombs. In air the burst must be close (30 feet or under) before the essential pressure of 35 pounds per square inch is exerted. In water this distance can be extended to several hundred feet. Contrary to expectations, atomic bombs have not produced many primary blast injuries as those affected within 1,000 feet of the ground zero were fatalities.

On the whole, the care of blast injury is conservative. A ruptured eardrum is protected against infection. "Blast chest" manifested by dyspnœa, chest moisture and hæmoptysis is symptomatically treated with sedation, rest and oxygen. Caution must be exerted to avoid precipitating lung œdema with over-zealous venoclysis or injudicious anæsthesia.

Abdominal blast injuries must be carefully observed for the occasional case complicated by ruptured hollow viscus, infarction, or persistent hæmorrhage. Only in the presence of these complications would active treatment be indicated. Similarly, blast trauma to the nervous system is treated expectantly. Only progression or localization of signs would indicate surgery.

(d) Crush Injuries

The term "crush injuries" was originally applied to patients sustaining an extensive contusion, recovery from which was complicated by renal failure. It was postulated that extensive muscle ischæmia—the result of trauma, tourniquet, or vascular injury—led to tubular obstruction from deposited myohæmoglobin. A further group of cases—the result of blood hæmolysis as it may occur in burns, mismatched transfusion, or hæmolytic toxins—similarly caused renal obstruction through the deposition of acid hæmatin. It is now well known that all shocked patients are potential candidates for renal failure as the result of ischæmic tubular necrosis. The exact etiology of oliguria in wounded patients is obscure; theories include the vascular shunt of Trueta, the blood sludging of Bigelow, and a break-down of the renal filtration mechanism from hypotension. It would seem preferable to discuss the care of wounded patients whose course has been complicated by renal failure rather than discuss the Crush Syndrome.

A realization of the risk of renal failure in wounded patients permits prophylaxis and early diagnosis. The prophylactic measures which seem worthwhile at the present state of our knowledge are:

(1) alleviation of shock to prevent renal ischæmia in all cases.

(2) assurance of an adequate fluid intake and alkalis to obtain an alkaline urine in those cases where muscle crushing or hæmolysis is a factor.

In these latter it is hoped thereby to avert the deposition of acid hæmatin and of myohæmoglobin in the renal tubules. Diagnosis is most simply made through a high index of suspicion leading to a careful watch of urinary output and, in all oliguric patients, a measurement of Non-Protein Nitrogen. The latter may not be practical under emergency circumstances, but severe oliguria in the presence of an adequate fluid intake is sufficient to institute measures of treatment.

Therapy can best be considered under these phases of renal failure:

Phase I. *Shock* which lasts for a matter of a few hours. The treatment of this is obvious.

Phase II. *Oliguria* which lasts for several days, appearing within 24 hours of Phase I. During this stage fluids should be administered with caution in amounts necessary for insensible losses — approximately 1,000 c.c.—plus the urinary output for the previous 24 hours. Low or no protein should be administered, but 100 gm. glucose a day should be assured for maximum protein sparing action. During this phase biochemical changes appear; in particular, acidosis and hypochloræmia. The former may need treatment with alkalis.

Phase III. *Recovery*.

(a) Diuresis lasting approximately from the 5th to 12th day when there is return of a large urinary and electrolyte output. During this stage fluid administration and electrolyte dosage may be heroic to meet the losses.

(b) Convalescence during which time the kidney regains normal

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function. The state of convalescence may last for several months.

Summary

The early treatment of mass casualties of a traumatic type is threefold:—

I. In the Disaster Area where medically trained rescue groups and Aid Posts will:

(1) prevent further injury or infection by suitable splints or dressings,

(2) evacuate live patients,

(3) document fundamental facts of the injury,

(4) prevent panic.

II. Along Evacuation Lines—particularly the First Aid Stations. Here an establishment whose personnel include a few medical officers will function to:

(1) progress evacuation with regard to priority,

(2) initiate antibiotic therapy,

(3) on occasion, be prepared to hold patients,

(4) be prepared to perform

   (a) urgent resuscitation,

   (b) emergency surgery.

III. Emergency Hospital.—a relatively well staffed medical unit whose particular problem it is to carry out the primary surgery of the wounds, aided by the adjunctive measures of shock and infection control.

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TREATMENT OF BURNS

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This article deals with the treatment of thermal burns under such circumstances as are envisaged following an atomic explosion. Combination of various types of injury will occur, but it is likely that casualties due to heat will exceed all others in number. Although circumstances such as the season of the year, the number of casualties, availability of supplies, functioning of ancillary services etc., will undoubtedly modify what can be accomplished, forward planning is necessary.

Briefly the levels of casualty service are:

(1) *disaster area* in which treatment is to be delivered by first aiders only.

(2) *first aid stations* where the injured *may* be held for twenty-four hours and where doctors, nurses, first aiders, etc., are available.

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(3) *emergency hospitals* in most of which the set-up will allow only simple laboratory determinations to be made.

The treatment advised at these levels is outlined. Nothing new is brought forth. The therapy of burns at the first and second levels *is to be* empirical, and at these levels neither time nor facilities will allow personnel to indulge individual preferences in their handling of patients. Specialists are to be located at the third level where facilities *may* exist which will permit modifications of therapy to fit individual needs.

Within broad limits, the clinical course of a burned person can be foretold. On the whole, troubles are likely to arise due to a number of factors, which may be observed immediately the patient is seen. The important items are

Relationship of Extent of Burn to Mortality
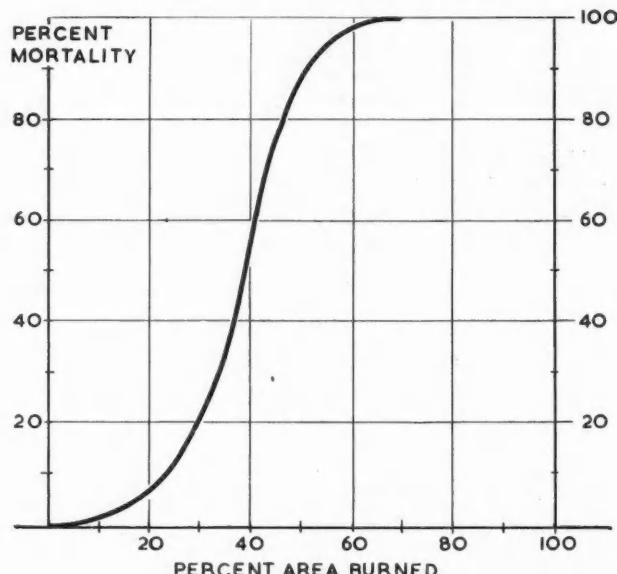
Fig. 2

Fig. 2 shows, in a rough fashion, the relationship of the extent of the burn to the mortality. It is noted that the mortality rises steeply, when over one-third of the surface is involved. Not many patients survive with deep burns of one-half of the body surface.

(2) *The age of the patient.* Frail and aged persons have a poor prognosis. Fig. 3 shows, in a rough fashion, the affect of age on mortality for burns of different extent. Under emergency circumstances, it can be expected that these mortality rates will be much higher. This

Head and neck····*·10%
    Front ··· 5
    Back ···· 5

Both upper limbs·15 %
    Arm ····· 5
    Hand ···· 2 ½

Trunk ··········· 40%
    Front ···· 20
    Back ····· 20

Both lower limbs··35%
    Thigh ···· 10
    Leg ········ 5
   Foot ······· 2 ½

*Approximate surface areas.

Fig. 1

four in number. For the planning of therapy observation of these must be recorded and the margin or error should not be too great.

(1) *The extent of the area burned* compared to the total body area. Fig. 1 shows a simple method of reckoning this. This does not give an accurate computation as there is much variation among individuals, and particularly between small children and adults. A rapid estimation without a large margin of error is the aim.

## Relationship
## of Age to Extent of Burn and Mortality
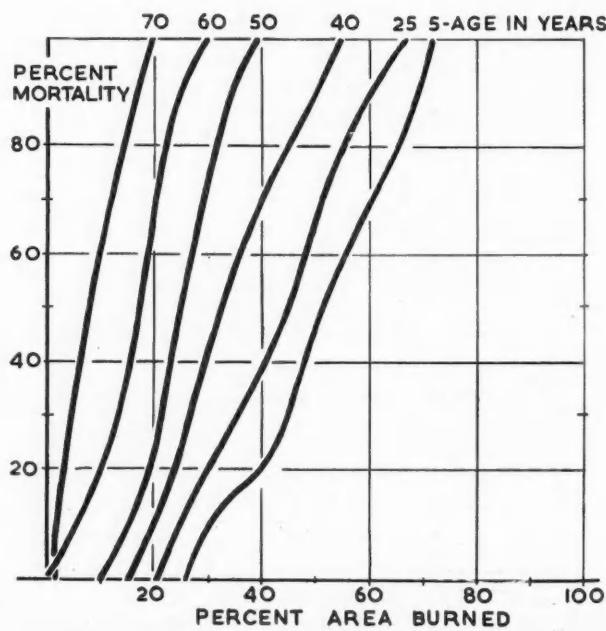
Fig. 3

knowledge may be valuable if it is necessary to practise triage.

(3) *The depth of the burn*. Except for very superficial damage, this is a difficult factor to estimate accurately. The uninitiated usually believe the damage to be more superficial than is the fact. For purposes of notation, the depth of burn may be described as first, second, or third degree (see Fig. 4). The first degree is damage to the epidermis and is recognized as an erythema which is followed later by superficial scaling. The second degree is damage to the dermis. The dermis being much thicker than the epidermis, it is possible to further classify the second degree burn into superficial and deep varieties. It is recognized by bleb formation and in the case of deeper second degree burns by a "cooked" appearance of the surface. The deep second degree burns are extremely difficult to
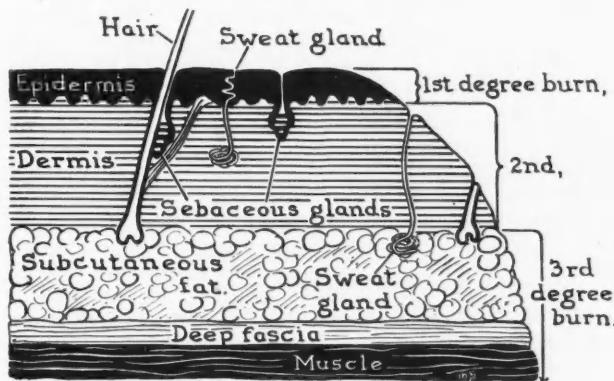

Fig. 4

differentiate from the third degree burns which include those in which the damage extends completely through the skin into the deeper tissues. In these, there is sometimes a "cooked" appearance and sometimes the surface is charred. The first degree burn is not of great clinical consequence, and is accordingly left out of the estimate of area burned. The superficial second degree burns heal rapidly (5 to 14 days) and leave little scarring. The deep second degree burns heal slowly with much scarring. The third degree burn if large, requires skin replacement. Sometimes the deep second degree variety is more suitably treated by skin replacement also. It is the deep second and third degree burns which need prolonged hospitalization and present serious problems for late treatment. For this reason, an attempt should be made when the damage is first viewed to distinguish between a shallow and a deep burn, so that segregation and disposal of patients will be facilitated.

(4) *Combined Injury*. The combination of burns and other trauma (radiation—crush injury—fractures etc.) raises mortality and morbidity rates considerably. This must be taken into account, if triage is practised, either to signify the uselessness of therapy for some patients, or the urgency of therapy for others.

A measure of the above factors allows a fairly accurate estimate to be made of the prognosis concerning both mortality and morbidity. It also gives most of the data from which is translated the urgency, quantity, and quality, of early general therapy.

In addition to the above factors, it should be appreciated that a burn causes a wound from which noxious substances are absorbed. These may be from the burned tissue and from anything which comes into contact with this particular variety of wound. Therefore, in any planning for local therapy (be it open or closed), care must be taken not to exhibit to this wound, materials which are damaging either locally, or by virtue of absorption, generally.

With the above preamble, the following is advised for the treatment of mass burn casualties at the levels noted above.

First Aid in the Disaster Area

At this level first aiders are equipped to give drugs for the relief of pain and to apply dressings. If the patient is unable to walk, transport will be available. Variable weather conditions (winter or summer) may affect treatment at this level.

The first aiders are to use drugs for the relief of pain, sparingly. If morphine in syrettes is available, it should be used chiefly for persons with combination (fractures etc.) injuries. The full dose ($\frac{1}{4}$ gr.) should only be given to adults and for children the dose should be scaled down in proportion to weight. Large doses abet the harmful anoxia which accompanies the secondary shock of severe burns. Other drugs, such as the barbiturates, should be substituted whenever possible. An individual with a small burn (under 10%) and who can walk, can be left without special dressing and directed to the first aid station. If the burned area is extensive, first aiders should place a sheet or other clean covering on the stretcher, put the patient on it and wrap the remainder of the covering around him. Clothing should be loosened but not removed.

First Aid Station

Professional personnel will be present at this level, and the burn should be inspected by a

physician. A gentle debridement of the surface may be performed with removal of gross dirt and the wiping away of loose epithelium. The burned area (with the exception of face and genitals) should be covered with the burn dressing pads provided. These should be bandaged into position. The dressing materials have been standardized. The pads are of two sizes and have an inside surface of fine mesh gauze, a layer of compressible absorptive cotton, a layer of cellulose wadding, and an outside wet repellant covering. The bandages have little elasticity, but the dressing is to be applied as an occlusive pressure dressing, extending well beyond the burn area and held by firmly applied bandages. On the outside, the individual who performs the dressing, draws the approximate outline of the burn area with a wax pencil. This is to include the second and third degree burn only. An estimate of whether it is shallow or deep is also marked on the dressing cover.

The patient is to be encouraged to take fluids. Sedative is given intravenously, hypodermically, or by mouth, as indicated.

The percentage of the total body surface as pictured on the surface of the dressing is calculated (Fig. 1) and recorded. If this is 10 per cent or greater, general therapy is commenced. Amounts of intravenous fluid therapy are given according to the following formula for the first twenty-four hour period,—four cubic centimetres of blood substitute for each per cent of burned surface for each *ten* pounds of body weight, plus an equal amount of isotonic saline, plus an equal amount of 5% dextrose in water. When first seen, if the patient is in obvious secondary shock (fast heart beat, clammy slate grey extremities with a slow return of colour after blanching by digital pressure, irrational or semi-comatose), the intravenous fluids therapy is to be expedited and one-third of the twenty-four hour volume of blood substitute should be delivered within one hour. Pressure may be applied to hasten the rate of intake or more than one intravenous apparatus may be started. Blood is not likely to be available at this level and before administration grouping and crossing are required. Therefore, the following in order of preference are used,—plasma, reconstituted serum, plasma volume expander, dextrose in saline, saline and dextrose in water. The plasma volume expanders provided are polyvinylpyrrolidone (P.V.P.) and a polysaccharide (dextran

or macrodex). The fluids given and amounts of each are to be recorded. Tests to establish more accurately the fluid replacement requirements are not likely to be available at this level and under no circumstances should treatment be delayed for the development of clinical signs of secondary shock. If the patient will take oral fluids, water may be given if the following solution is not available,—one quart of water to which has been added a level teaspoon of salt, and a half a level teaspoon of bicarbonate of soda.

At the level of first aid stations, the main effort in the treatment of the burn casualty is fluid replacement. While substitutes for blood are used, it must not be forgotten that they have no oxygen carrying capacity. Many patients would be better with some blood and particularly those with extensive deep burns.

Antibiotics are to be used prophylactically if they are in plentiful supply. Otherwise they are to be reserved for the patients with extensive burns and particularly those with extensive deep burns and combined injuries. Penicillin is given intramuscularly in a single daily dose of 400,000 units (300,000 units of procaine penicillin plus 100,000 units of crystalline penicillin per c.c. as supplied). Concomitantly in extensive deep burns or those with severe combination injuries, one may give streptomycin, 0.5 grams intramuscularly twice a day or one of the broad spectrum antibiotics (aureomycin or terramycin) 250 milligrams by mouth four times a day.

Except for the very young or aged, the patients with less than 15 per cent burns may be allowed up, and are to be encouraged to help with their evacuation to the emergency hospitals. Priority should be given to the seriously injured for their transfer to the emergency hospital level.

Emergency Hospitals

Patients should be arriving at the emergency hospitals within twenty-four hours. Those who remain at first aid stations have their treatment continued at that point (until evacuation) as outlined for the emergency hospitals.

The general condition of the patient is the first consideration. Fluid intake and urinary output are to be recorded. All patients with over 25% burns (and those over 60 years with over 15% burns) are to have an indwelling catheter for five days so that output can be accurately measured. Except in infants, the output should

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be at least 25 cubic centimetres an hour. If the output is small as the result of inadequate intake, a significant increase should be obtained by 5 c.c. per pound body weight of 5% dextrose and water given over a two hour period. Inability of the kidneys to function should be considered if the response is not apparent. In such a case, salt is restricted and only enough fluid is given to replace the insensible loss through the skin and lungs.

It is not likely that tests requiring specially trained technicians or intricate apparatus will be available in the emergency hospitals. However, hæmoglobin estimations, blood counts and smears and urinalysis will be possible so that some guide can be obtained for continued intravenous therapy. If it is necessary to treat empirically—approximately one-half (more in small children) of the first twenty-four hour fluid requirements should be adequate for the second day. The intravenous fluid therapy, should be continued until the patient has an adequate oral intake. This is usually so at the end of the second day for those with burns of 20% or less. Intravenous therapy may be necessary as a supplement for many days in the more severely burned. For the latter, there should be available good laboratory facilities either by transport of specimens or the patient.

The problem of fluid replacement being under control, decision for definitive local therapy must be made. The local application having been made at the first aid station, inspection of the area may be indicated at the emergency hospital level. Those dressings marked "shallow" may be removed and the areas left open for plasma clot formation, or redressed if it is considered that the original guess was in error. Those dressings marked "deep" may be inspected when warranted by the patient's general condition. Such patients should be transferred within ten days, to hospitals equipped for surgical procedures. The first redressing (other than noted above) is performed in ten days, unless the condition of the patient, or the dressing indicates earlier redressing. The patient may be running an unexplained swinging fever with copious discharge from the wound or the dressing may be moist and foul. Dressings, which become soaked through, should be changed if possible. They become the breeding place for mixtures of organisms

Secondary anæmia of severe degree develops rapidly in severely burned patients. Laboratory

tests will give indication of this, and the patient should be protected by blood transfusions and placed on daily doses of iron. The nutritional state will deteriorate rapidly with extensive third degree burns, the weight loss becoming readily apparent within 7 to 14 days. To forestall this, high caloric, high protein diets are enforced. If these are refused, additional feedings can be given via duodenal tube as a continuous drip. Diets are to be vitamin supplemented.

The prophylactic antibiotic therapy which was commenced at the first aid station is to be continued. Wherever possible in cases in which infection is considered a factor of importance, cultures should be taken in order to obtain knowledge of the susceptibility of the various organisms against the antibiotics available. The local application of the antibiotics may be indicated. The usefulness of the sulphonamides (sulphadiazine, will be available) should not be forgotten.

The indications for such drugs as adrenocorticotrophic hormone, cortisone, adrenocortical extract, growth hormones, etc., are not clear enough to warrant their use. Actual harm may be caused by them, particularly if the timing in their employment is wrong. It is accordingly advised that there is no place for such drugs in the treatment of mass burn casualties, at the present time.

The preparation for grafting of an area of deep burn damage is important. Small deep burns may be excised. The area may be grafted immediately or such area may be left undisturbed for a few days until a thin layer of granulation tissue has formed and then grafted. If facilities are adequate, larger areas may be treated in this manner also. The sequestration of dead tissue from a larger area usually takes place in eighteen to twenty-one days. It can be hastened by chemical and enzymatic agents. At this time, such agents as are in general employment are not startling in their effect and present considerable trouble in their use. For the treatment of mass casualties, they will therefore not be stocked at present. Sodium hypochlorite in a hypertonic solution applied on dressings is useful—(Dakin's solution, eusol, hygeol). The dressings should be kept moist and changed at least daily. Baths would be of use at this stage but require special apparatus and trained assistants.

Early grafting is life-saving for patients with extensive deep burns. At present the only place

for homografts is their use as a temporary covering. Occasionally this is indicated. All patients will eventually require recovering with their own skin. Thin (ten-thousandths of an inch) partial thickness skin grafts are used in most instances for larger areas. Any detailed discussion of this phase of therapy is beyond the scope of this article.

In conclusion, burns are expected to be the major problem in therapy if and when atomic bombing of large cities happens. The number of individuals with combination injuries will add greatly to mortality and morbidity rates and to the difficulties encountered in therapy. The treatment of mass casualties must be as simple as is possible, compatible with the circumstances. At such a time, the foregoing may be useful as a reference guide.

TREATMENT OF FRACTURES IN MASS CASUALTIES

A. D. McLACHLIN, M.D.*

Injuries due to heat will provide a large proportion of the casualties in a disaster area. Apart from this and the later effects of irradiation, the problems should be very similar to those encountered under battle conditions.

Soft tissue injuries are considered elsewhere. This section will be devoted to fractures and treatment will be discussed under three headings: (1) First Aid in the Disaster Area; (2) First Aid Stations; (3) Emergency Hospitals.

(1) *First Aid in the Disaster Area* will be essentially the splinting of fractures so that further damage will not occur during transport. The Thomas splint is an ideal means of immobilizing either the arm or leg. Adhesive traction or an apparatus that will permit traction through the shoe without danger of constriction or skin necrosis will aid in immobilization. It is unlikely that Thomas splints will be available in adequate numbers in a disaster area. Long wooden splints are more easily stored and transported and may prove more practical. The splintage value of the opposite leg in injuries of the lower extremity and of the trunk in injuries of the upper extremity should not be forgotten. Adequate padding, especially about pressure points, and the avoidance of any constriction must also be remembered.

Bleeding from compound fractures will rarely, if ever, require a tourniquet. A large dressing placed in the wound and held securely in position by bandaging will almost always control bleeding without the danger of loss of limb inherent in use of a tourniquet.

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Injuries of the vertebral column should be lifted and transported without flexion or rotation of the spine.

Stretchers or some similar improvisation will be essential in transport. Vehicles of all types will be utilized as best possible. The patient should be kept on the same stretcher during all the initial stages of his treatment. The deleterious effect of any unnecessary shifting of patients has been shown very clearly in both civilian and war casualties.

(2) *First Aid Stations* will provide the materials and personnel for more adequate first aid treatment. Splintage may be adjusted or changed to a more suitable form. A burn which constitutes the major injury may relegate the fracture to a comparatively minor position in the over-all treatment. If it seems wise to concentrate on treatment of the burn, the fragments should be so aligned that a closed fracture will not be changed to a compound one and the limb should be immobilized in the best position obtainable under the circumstances. If plaster of paris is employed at this level or any level where absolute supervision cannot be obtained, the plaster should be split to the skin for its full length. The dangers of occlusion of blood supply and increasing swelling within a circular plaster cannot be over-emphasized. Splitting the plaster will be facilitated by placing a piece of heavy rubber tubing coated with vaseline against the skin for the full length on the dorsum of the extremity before padding and plaster are applied. When the tube is pulled out, a groove is left for insertion of a plaster cutter. With the division of responsibility that will be essential in the treatment and shipping of mass casualties, this principle of splitting all circular plasters from top to bottom to the skin should be well established. For similar reasons, there seems no place for the unpadded plaster.

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It is not expected that definitive treatment will be given at First Aid stations but that casualties will be passed on to Emergency hospitals within a 24-hour period.

(3) *Emergency hospital service* will be provided by existing hospitals within the range of transportation and by improvised hospitals. These improvised hospitals will be set up in suitable buildings such as school houses and staffed by emergency teams that have been brought into the periphery of the disaster area. The arrangements might compare with those of a C.C.S. or a combination of Field Surgical and Field Transfusion Units, constituting an advanced surgical centre under battle conditions. Definitive treatment will be given in the Emergency hospital and the patient held as long as a week before shifting to a more distant hospital where the final phase of management will be carried out.

Determination of priority of treatment will be extremely important. Handling large numbers of patients with a limited staff may make it impossible to carry out methods of treatment that are now common in civilian practice. Closed fractures that would ordinarily be treated by open reduction would very wisely be placed in plaster in the best position possible. Any open interference should be delayed until the patient reaches a centre where pressure of work and hospital conditions will permit the care necessary in undertaking conversion of a closed into an open and potentially-infected fracture. Delay of a week in a necessary open reduction will make little difference in the final outcome but will permit concentration of attention on the compound fractures that threaten both life and limb. It would be a wise rule that no open reduction of a closed fracture be attempted in the treatment of mass casualties until conditions equal to those in civilian practice be assured. In the interim, each fracture should be immobilized in the most satisfactory position obtainable under the circumstances.

Compound injuries will be a major responsibility of surgeons dealing with fractures in a disaster area. In these patients, inadequate or too long delayed treatment may prove disastrous. There will be a few cases with only a minute split in the skin that could not have permitted bone protrusion. Some of these may be treated as closed fractures with the aid of antibiotics. If the bone has protruded through the skin, the injury should be given high priority. This is

especially true if the fracture has been compounded by violence from without with the added danger of deep contamination and retention of foreign bodies.

After adequate resuscitation, the limb should be shaved, cleansed and draped with all the care that the local situation will permit. A tourniquet is rarely necessary. After initial clean-up of the
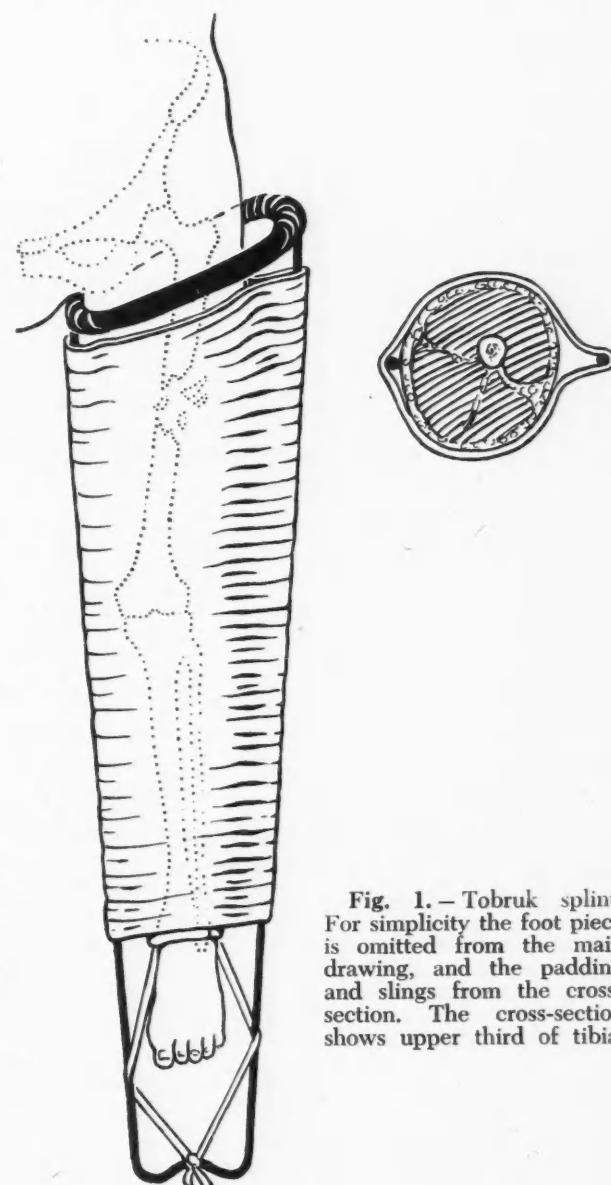
Fig. 1. – Tobruk splint. For simplicity the foot piece is omitted from the main drawing, and the padding and slings from the cross-section. The cross-section shows upper third of tibia.

superficial part of the wound, the first instruments should be discarded. The fracture site should be exposed through an incision in the long axis of the limb, of length to insure easy access to the depths of the wound. In general, the length of the incision should be twice its greatest depth. Skin edges are very viable and should be preserved. Muscles are split in the direction of their fibres and major vessels and nerves re-

spected. All non viable tissue should be removed and the depths of the wound explored with a finger tip. Foreign bodies and free bone fragments are removed. Bone fragments with periosteal attachment are preserved. Irrigation with saline will aid in clearing the wound by floating up small free fragments. Hæmostasis should be meticulous.
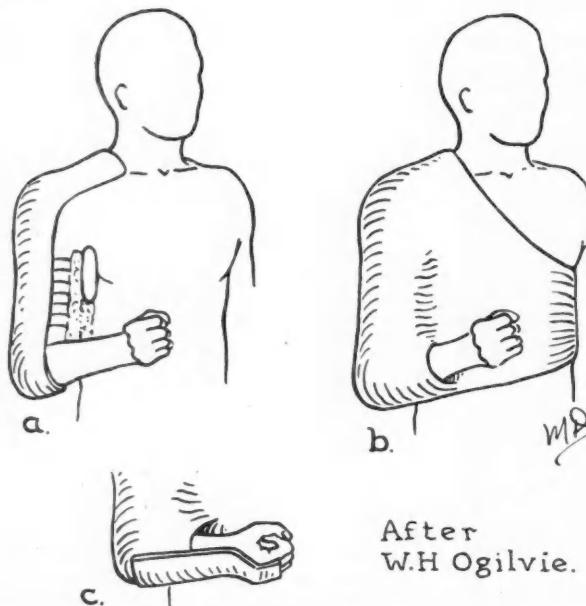

Fig. 2.—Thoraco-brachial splint: (a) the slab in position; (b) the splint completed; (c) (from above) the plaster cock-up added.

When the above procedures have been completed, the fragments should be placed in the best position possible. In mass casualties, it would be unwise to attempt any form of internal fixation at this stage, and holding the wound open loosely with fine dry gauze or vaseline gauze would be much safer than an attempt at primary suture. If the patient is to be transported further within a few days, the Tobruk splint for leg injuries (Fig. 1) and the thoraco-brachial box for arm injuries (Fig. 2) as practised in World War II would be very useful. If the patient is to be kept in the hospital in which his initial definitive treatment was given, some more permanent means of immobilization could be used along with skeletal traction if indicated.

If number of casualties and difficulties in transport make it impossible to deal with compound fractures before infection has become established, the principles of removal of devitalized tissue as described above would have to be modified and the procedure would be essentially establishing free drainage and removing obvious contaminants and free fragments.

If, after five or six days, the general and local conditions are satisfactory and the patient has reached a site where adequate supervision can be assured, the reduction can be completed and the skin closed. Skin edges will close as easily at five or six days as at initial operation and the safety of this method is a strong recommendation in its favour.

If the condition of the wound is less satisfactory, or there has been some infection, it would be wisest to allow granulation to proceed from the depths with hopes of skin grafting or secondary closure of the wound at a later date.

A conservative approach to the closing of compound wounds will likely give the best overall results when a limited personnel may be called upon to treat a large number of casualties under conditions that are far from ideal. It is impossible to establish rules that will be a substitute for surgical judgment. When the patient has reached a level where the facilities of modern surgery can be employed with safety, the restrictions described above need no longer apply.

TREATMENT OF INJURIES TO THE EYE

CLEMENT McCULLOCH, M.D.,*
R. G. C. KELLY, M.D.,*
HARRY M. MACRAE, M.D.*

First Aid Workers going into a devastated area will see five types of injuries to the eyes; foreign bodies and lacerations, contusions,

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damage due to burn by heat or short waves, or damage due to poisonous gases or other noxious chemicals. These injuries may occur from various causes, such as from an atomic bomb, from ordinary explosions, or from fires. In one area, or in one patient, there may be several types of trauma occurring at one time.

In every case suffering from a foreign body in, or a laceration of, the eyeball, decide two points. Is the injury penetrating or is it non-penetrating? Is the cornea grossly affected or is it not damaged?

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The cornea is the clear window lying in front of the coloured part of the eye. If the patient is having pain or discomfort in the eye the cornea is probably affected: if the patient is not suffering the eye may be severely injured but at some other point than at the cornea.
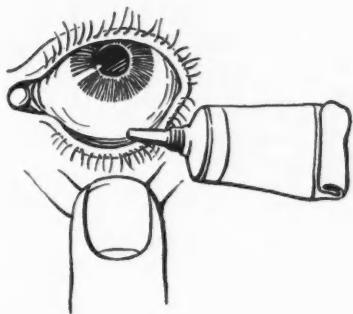
Penetrating Wounds

Wounds, and foreign bodies, which pass into the interior of the eyeball, do so through the sensitive cornea, or through the relatively insensitive white of the eye. The eyeball will be collapsed if the wound is large, but may be intact if the wound is small. If the entrance is through the cornea the pupil may be displaced towards the wound. If entry is through the white of the eye the opening to the interior may not be visible on casual inspection. When the eyeball has been penetrated cover with a pad, and send the patient to your First Aid Station for direct routing to the nearest ophthalmic unit. Perforations of the eyeball are injuries which should reach the ophthalmic unit as soon as possible, and which should not be tampered with before
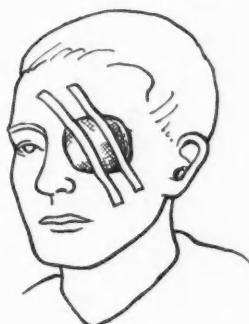
that time. This statement applies whether there is a penetrating laceration of, or a foreign body inside, the eyeball. If the eyeball is soft the patient should be transported by stretcher.

Non-Penetrating Wounds

Lacerations and foreign bodies which do not enter the eye are more common than those which are penetrating. If the eye is painful the cornea is involved; Tetracaine ointment will relieve the pain. Cover the eye with a pad. The patient should be able to walk back to the First Aid Station. If the eye is not painful, but you can see a foreign body or a laceration, instruct the patient to report to your First Aid Station.

Contusions

An eyeball may be severely injured by direct force, without being perforated. This can occur when a blunt object strikes the eye with considerable force, and will be evidenced by pain, loss of vision, or blood lying over the dark of the eye. Patients with such an injury should walk, or can proceed by a convenient mode of transportation, to some place where they can be immobilized, in bed, and seen by an ophthalmologist.

Burns from Heat

Many burns, whether from short or long waves, cause great discomfort but, ultimately, are not serious. The patient needs relief from pain. Instil Tetracaine ointment and instruct the patient to report to your First Aid Station. Severe burns of the eye will usually be seen in patients who have extensive burns elsewhere, particularly on the face. Such a patient will go to your First Aid Post, and from there be sent to a larger treatment centre. Treatment of the general burn will, likely, be your first concern. Put some Tetracaine salve in the patient's eyes and have him transported to your First Aid Station.

Chemicals

If a harmful chemical, such as mustard gas, a "nerve" gas, acid, or caustic, has entered the eye, wash immediately, with copious amounts of water from your canteen bottle. Open the lids to allow the water to flow next to the eyeball and behind the upper and lower lid. Instil Tetracaine salve and send the patient to your First Aid Station.

The First Aid Worker should label patients as "eye injury", or "serious eye injury". A serious eye injury is a laceration or foreign body which has penetrated the eyeball, a contusion, or a severe burn.

At the *First Aid Station* handle the cases according to the following program. In general, if the injury is such that healing will be complete

in two days the final treatment can be given. If recovery will take more than two days refer the patient to the nearest ophthalmic unit.

Penetrating Wounds and Foreign Bodies

Patients with an intraocular foreign body, or with a laceration which perforates the globe, should go to the nearest ophthalmic unit. Do not disturb any gaping wounds of the eyeball. A patient with a soft eye should go on a stretcher.

Non-Penetrating Wounds and Foreign Bodies

When a foreign body is present in the cornea instil Pontocaine ½% drops until the cornea is anæsthetic. With a spud lift off, cleanly, the foreign body. Put some Tetracaine ointment in the conjunctival sac. If the removal was difficult cover the eye with a pad. If the foreign body came away leaving but a small abrasion the eye may remain uncovered. Unless the wound is trivial an eye with a non-penetrating laceration of the cornea should be covered with a pad.

When foreign bodies lie on the white of the eye, or under the upper or lower lid, anæsthetize with drops of Pontocaine ½% and remove the particles. Instil Tetracaine salve. A non-penetrating laceration over the white of the eye is not an indication to cover the eye with a pad. Only when the injury is severe should the eye be covered with a pad, or should the patient be sent to the nearest ophthalmic unit.

Burns from Heat or Short Waves

Burns of the eye will usually be seen in patients who have generalized burns. Treatment of the eyes will need to be integrated with the treatment of the more widespread burn. Instil Tetracaine salve. If the injury to the eye is at all severe the patient should be forwarded to the nearest ophthalmic unit. If the patient is going to a centre for the treatment of his burns he should be labelled with a tag indicating that he has an injury to his eyes.

Mild burns of the eyes cause a lot of pain and photo-phobia, but heal quickly with no complications. A patient with a lot of pain and photo-phobia, but with the history of only a mild burn, showing only slight œdema of the lids and little damage to the eyeball, may be of this type. You may need to instil Pontocaine ½% drops to see the eyeball. If the eye appears in good order instil Tetracaine ½% salve, cover the eye with a pad, and instruct the patient to remove the pad in forty-eight hours.

Poisonous and Caustic Chemicals in the Eye

Insult to the eye by poisons, or caustics, should be treated at once. Wash the conjunctival sac of the affected eye continuously for five minutes with clean water. Turn the upper and the lower lid and remove any foreign material found on the inner surface. Instil Tetracaine salve. Many of these cases will be serious, and will need to be referred to an ophthalmic unit.

If droplets of one of the so-called "nerve gases" have fallen in the conjunctival sac the patient will have pain about the eye, or headache, blurred, dim or dark vision, and a small pupil. Wash the conjunctival sac and instil atropine expressed from a syrette. In all but mild poisonings further treatment will be given at a hospital.

INJURIES DUE TO COLD, FROSTBITE, IMMERSION FOOT AND HYPOTHERMIA

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W. G. BIGELOW, M.D.*

Injuries from cold have played a major rôle in many military campaigns. History has many examples of the bitter price paid by those who entered these campaigns unprepared, or were overtaken by winter with insufficient clothing,

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food and warmth. It requires little imagination to visualize the effects of an attack on one of our large cities in mid winter. The injuries of those lying exposed to the elements in sub-zero weather, awaiting rescue, would be vastly complicated by general chilling and actual frostbite in vulnerable or exposed portions of the body. Even the uninjured, forced into the open insufficiently clad, would soon become casualties if shelter was not readily available. If a community suffered an atomic bomb blast, the large number of casualties and sufferings inevitably inflicted, would be dreadfully augmented by the effects of cold, snow and ice, and the interruption of

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supplies of gas, oil, electricity and other essential services. As with other injuries, proper preparation will help reduce the incidence. Stores of warm clothing, blankets and auxiliary heating units should be available in as many homes and buildings as possible. Rescue teams should be well organized to speedily remove the injured and shelter the homeless.

Physiology and Pathology

The result of exposure of a limb to cold depends on several factors. These are the degree of cold, the duration of the exposure, amount of moisture and the resistance of the individual. This latter factor may be modified by the state of nutrition, physical fatigue, peripheral vascular disease, or by the possession of some poorly understood substances such as cold agglutinins that would increase the susceptibility to cold injuries.

When an extremity is exposed to severe cold, vasoconstriction occurs, evidenced by blanching of the skin. This may be followed by a bright pink colour due to vasodilation and lack of dissociation of oxyhæmoglobin. Vasoconstriction then occurs and is permanent in the chilled state. All of the vascular tree is involved, even to the major vessels. This appears to be a protective mechanism to conserve body heat but it is at the expense of the exposed limb. The phenomenon of supercooling may prevent solidification until the temperature is considerably below that of the normal freezing point. As the temperature falls, the chilled or supercooled tissue becomes solidified although brittleness is not evident in the ordinary clinical cases. There may be injury from anoxia due to the vasoconstriction, and actual damage to the cells from the freezing process. The anoxic state is augmented by capillary stasis, especially as seen in chilled limbs without actual freezing where there is escape of the plasma, leaving the red blood cells in a state of "silting" or "sludging" as described by Kreyberg and Greene. In frozen tissue considerable damage may be caused by the formation of ice crystals that continue to grow, disrupting the cells. This is not so evident in "quick freezing" as in a slower process. The thawing process is followed by a marked inflammatory reaction. Lewis suggested it resembled the "triple response" to histamine and thought the reaction might be due to the liberation of histamine-like products from the cellular injury. Thawing

occurs either from without, in, or along the course of the vessels as circulation is reestablished. Œdema soon forms with escape of plasma through the damaged capillary walls. Vesicles may form, especially on the dorsum of the foot, but are rare on the face. This usually reaches its maximum in 48 hours. Stasis in the capillaries is apparently due to simple loss of plasma, possibly to the action of cold agglutinins or abnormal adhesiveness of the red blood cells. The surface temperature of the part is raised considerably, probably due to the opening of arteriovenous channels. These channels may rob the injured part of adequate circulation as gangrene will sometimes develop in a part apparently well supplied with blood. As the œdema increases, areas of cyanosis may appear and there is always danger of infection in the devitalized areas.

Many terms have been used to describe the syndrome produced by exposure to cold such as frostbite, immersion foot, trench foot, chilblains, etc. The general effect of cold on the human body is commonly called hypothermia.

Treatment of Hypothermia
Introduction

It is conceivable that an atomic bomb attack upon a large city during very cold weather would produce casualties suffering from hypothermia or dangerous reduction in body temperature. With a very large area suddenly involved, unlike last war bombings, an injured person may be forced to lie exposed to the cold for long enough to suffer a serious fall in body temperature before evacuation.

The Problem

Persons rendered unconscious or suffering from true oligemic shock such as in hæmorrhage, lose the protection of their heat regulating mechansim and are likely to experience an immediate and continued fall in body temperature on exposure. Persons immobilized by extensive wounds lying exposed to the cold will likely maintain their body temperature for several hours, but, being unable to move about and lying in contact with a cold and perhaps moist surface, they will eventually experience a fall in body temperature and similarly become hypothermic casualties.

Under such conditions the body temperature will fall at about 5 to 18°F. per hour (depending on the environmental temperature) for an aver-

age adult and more rapidly for small individuals and children. As body temperature falls and respiration becomes slower, heart rate and blood pressure falls. The casualty will become increasingly stuporous and at a body temperature around 82°F. one may expect complete loss of consciousness. As the body temperature falls below 82°F. respiration will become very shallow and slow and will eventually cease. Some time following that, cardiac death will follow.

It is possible to revive hypothermic victims from body temperatures as low as 65°F. In the lower range of temperatures after loss of consciousness it may be very difficult to determine whether or not the individual is dead. With minimal or absent respirations the heart may still be beating slowly. Due to the reduced blood pressure it may be impossible by palpation and auscultation to determine this and he may be mistaken for dead. This natural error is periodically reported in civil life.

The majority of cases will very likely be suffering from a milder degree of hypothermia with no noticeable effect upon their consciousness and respirations. One may expect to find frostbite of the extremities in most cases of general hypothermia.

First Aid in the Disaster Area

No specific first aid measures are recommended to the casualty collecting units other than evacuation to the first aid post. Mild degrees of hypothermia will likely not be recognized by the C.C.U. personnel. In very cold weather, during the collection of casualties who have received their injury several hours before, the C.C.U.s, should be prepared to recognize cases of severe hypothermia as described above.

First Aid Station

The chief duty of personnel at this level is to recognize when a casualty is suffering from hypothermia by observing the rectal temperature with a thermometer possessing a lower range than the ordinary clinical thermometer. Rewarming should be carried out with warm blankets in a warm room. Cases of severe hypothermia, below 85°F., will require oxygen, perhaps artificial respiration if their colour is blue, and evacuation to an Emergency Hospital. This is important and if respiratory depression is marked, positive pressure oxygen would be the ideal therapy.

If hypothermia cases are being admitted, the first aid station is warned not to interpret the reduced blood pressure of hypothermia, as due to hæmorrhage or traumatic shock. Unnecessary blood transfusion may overload the heart.

Emergency Hospitals

The method of rewarming will be the same as for the first aid station. Respiration rate, blood pressure and rectal temperature should be charted periodically. Severe cases in which it is difficult to obtain the pulse or hear the heart beat, may best be followed with an electrocardiograph. Here again positive pressure oxygen therapy is indicated. It would be wise not to pronounce such a casualty as dead without electrocardiographic evidence.

Cardiac arrest may occur. This will take the form of ventricular fibrillation; or defibrillation or electrical stimulation of the heart may be required and used if the equipment is available.

Cardiac stimulants will not be of much value. The chief therapeutic measure is to ensure full oxygenation of the blood. Sedatives should be used *sparingly* in hypothermic casualties particularly (and preferably not at all) if they depress respirations.

A radio-frequency technique for restoring the body temperature to normal has recently been developed by the Defence Research Board and the National Research Council. This involves placing the patient between two large padded electrical coils. It is in the experimental stage at present, but may be available for resuscitation purposes.

Surgical operations may be performed upon patients with a body temperature over 80°F., if necessary, provided minimal anæsthetic is used and positive pressure oxygen maintained. Once again, care must be taken not to restore the blood volume above normal by excess transfusion of blood, blood substitutes or crystalloids when hypothermia and traumatic shock coexist.

Frostbite

This term is used to describe the condition resulting from exposure to cold of sufficient severity and duration to produce ice in the affected parts. In frostbite there is early vasoconstriction that can be relieved occasionally by vigorous rubbing as is often seen in the ears. This will frequently prevent further injury as the resultant hyperæmia will enable the tissues

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to maintain an adequate temperature. When the defenses are overcome, freezing occurs. Anæsthesia is limited to the frozen area, thus differing from immersion foot, and œdema does not occur until the part is thawed. The sequence of events is then similar to that of injury due to chilling or wet cold. Frostbite injury is usually divided into four degrees:

1. Reddening which may be followed by desquamation.
2. Vesication.
3. Destruction of the true skin.
4. Involvement of the deeper structures even including bone.

Unless the duration and degree of exposure is known, it is very difficult to estimate the degree of damage and the final definition may not be possible until the clinical course has been established.

Immersion Foot—(Trench foot)

This is the name given to a condition resulting from long exposure of the limbs in icy water or to a cold, moist environment. The term is inadequate as the limb need not be immersed and it also occurs in other members.

The severity of the cold is not sufficient to cause freezing, but the conduction of heat from the tissues sets up a syndrome that has immediate and disabling sequelæ. It resembles and is probably identical with the trench foot of the First World War. After some hours of exposure the feet which are at first painful, become swollen and numb, the œdema involving almost all the exposed part. They are first a livid colour, which later changes to a pallid waxy appearance, and if the temperature rises slightly, become mottled with blue and green areas. After rescue and exposure to room temperature, the affected limbs pass through three stages: prehyperæmia, hyperæmia and posthyperæmia.

Prehyperæmic Stage

At first the feet are numb, the patient feels as though he were walking on blocks of wood and should always be assisted. The colour begins to change from pallor to lividity and the legs show various colour patterns. Vesicles and even large bullæ appear. There is anæsthesia of a stocking type with occasional hyperalgesic areas. The posterior tibial and dorsalis pedis arterial pulsations cannot be detected.

Hyperæmic Stage

At ordinary room temperature the feet quickly pass into the hyperæmic stage. The limbs become hot to the touch and the colour a livid red. The dorsalis pedis artery becomes palpable and bounding in character. The circulation is unstable. Congestion appears when the legs are in a dependant position and blanching when elevated. The pain at this period is intense and of a throbbing, burning character. This may last for several days and then change to a shooting, stabbing pain in the dorsum of the foot, radiating to the toes. This may last for several weeks. The œdema increases and large blisters are common, especially over the dorsum and malleoli. In severe cases, portions of the foot, usually the toes, remain discoloured and cold, heralding the onset of gangrene.

Posthyperæmic Stage

The hyperæmic stage soon merges in a few days into the posthyperæmic stage. The burning, shooting pains subside but the feet are subject to intermittent aching pain and œdema readily appears when the feet are in a dependant position. The circulation is unstable as evidenced by colour changes in different positions. Excess sweating is common and the patients complain of cold clammy feet. Walking is often difficult as proprioceptive sense appears deficient. The sensitivity to cold, hyperhidrosis and pain may persist for a long time and present a difficult problem in rehabilitation.

Treatment

The aim of the treatment of frostbite or immersion foot is to prevent or minimize necrosis. This has been the subject of a large amount of experimental work and the interest of many military surgeons. It was thought for a long time that slow thawing or warming in frostbite was essential to allow the vessels time to recover their tone and to limit the resulting hyperæmia so that the increased metabolic demands of the injured tissues could be met by an adequate blood supply. To accomplish this, the limbs were packed in icebags and cooled with fans or special cabinets. Experimental work on animals in the last few years has indicated that after quick freezing, less tissue is lost by rapid thawing than by slow warming and that stasis in the vessels is delayed. There is evidence that the larger vessels are in spasm during the chilling

period and only relax when the tissue temperature is nearly that of body temperature. While the results of animal experiments cannot always be applied to man it is probable that no harm is done if the frozen part is allowed to return quickly to body temperature, or assisted by water at a temperature not above 42°C. Diathermy is being investigated and may be of value.

First Aid in the Disaster Area

The patient with frostbitten feet should be moved on a stretcher and not permitted to walk. No massage or rubbing should be carried out. The frozen area should be covered with a large sterile dressing. The tag should indicate if possible how long the patient has been exposed to the extreme cold so that a rough estimate may be made of the degree of injury. If pain is severe, morphine gr. ¼ hypodermically may be given, or a long-acting barbiturate.

Treatment at the Hospital

There is frequently some confusion in considering frostbite and immersion foot. Recent experimental work deals almost entirely with frostbite and the casual reader may consider the therapy advocated for acute frostbite as applicable to immersion foot. Actually œdema and vesication may appear as an early stage of this lesion and actual freezing with ice formation is not a factor to be considered.

Immersion foot or its equivalent, resulting from exposure to moist chilling without freezing, will rapidly pass into the hyperæmic state on exposure to room temperature. War experience indicated that cooling had a marked sedative effect, relieving the almost intolerable burning that accompanies this stage. The clinical course is then very similar to that of frostbite and the treatment should follow as described below for frostbite after thawing has taken place.

On arrival at a centre where definitive treatment may be carried out the dressings should be immediately removed and the parts inspected. If blisters are present it is obvious that thawing sufficient to permit some circulation of blood has occurred. The vesicles should be left intact, but if they are ruptured the area must be protected against infection.

If the part is still frozen solid it should be allowed to thaw at room temperature. If a comparable group of cases could be observed, it would be of immense scientific value for the attending surgeon to try rapid rewarming in water not over 42°C. A control series could be treated by conventional methods. Pain which is quite marked as the tissues pass into the hyperæmic state, will require sedation with a long acting barbiturate or occasionally morphine. Cooling is very useful in controlling the pain.

Pledgets of cotton soaked in Benzolconium Chloride should be placed between the toes to prevent maceration and the whole limb covered with an occlusive dressing or light plaster.

Antitetanic serum and procaine penicillin 300,000 units should be given immediately and the antibiotic therapy must be continued until the danger of infection has passed.

Anticoagulant agents such as heparin or dicoumarol may be useful in preventing thrombosis in the injured vessels but they should only be used when adequate supervision is available. Lumbar blockage or lumbar sympathectomy have not been proved of value in the acute phase of frostbite nor in immersion foot where the sympathetic fibres seem to be inactive because of the cold injury. They may be tried however, if properly supervised as an occasional case is apparently benefited by the procedure. However, in the late sequelæ of painful, sweating hands or feet, where the digits become tapering and shiny, and the movements restricted, sympathetic interruption is of considerable value.

Vasodilating drugs and autonomic blocking agents such as Priscobine, Etamon and Hexamethonium Bitartrate etc., have a similar though not as effective action.

ACTH and Cortisone have not been found of value.

Smoking should be discouraged because of the vasoconstrictor action that follows in some individuals.

Necrotic tissue should be carefully debrided but amputation in noninfected cases should be delayed as long as possible. It is surprising how often one may be deceived in mistaking superficial necrosis for gangrene of a large part. Following definitive treatment, physiotherapy is a most valuable aid to rehabilitation.

There are many unsolved problems in the treatment of frostbite. It is evident that slight freezing causes little damage while in severe cases tissue is irrevocably lost. Any doctor who has the opportunity to treat a large number of injuries due to cold has a valuable contribution to make to our knowledge of the treatment and sequelæ of this condition.

TREATMENT OF ACUTE RADIATION SYNDROME

LT.-COL. F. C. PACE, C.D.*

For the purpose of this article acute radiation sickness is a syndrome produced by the impingement on the whole body of the highly penetrating electro-magnetic emanations from an atomic bomb in the first minute after the detonation of the weapon. The impingement of these gamma radiations causes, first, a physical disturbance in the atoms of the body constituents: second, a series of disturbances in the biochemical and other mechanisms of the body: third, the clinico-pathological condition termed variously acute radiation illness, acute radiation sickness or radiation-syndrome. This syndrome clinically is a tri-phasic illness. In the first phase, immediately after exposure and for a day or two after, occur nausea, vomiting, malaise and diarrhœa. The second phase is a latent period wherein the patient feels well and may resume full activity for three to ten days. The third phase begins with a step-like fever, to be followed by anorexia, vomiting, diarrhœa with blood stained stool, ulceration of the mouth and pharynx, subcutaneous and generalized petechial hæmorrhages, loss of scalp hair, anæmia, secondary infections (often of the respiratory tract): with death in many cases between the third and sixth weeks. The chief histological changes are necrosis of lymphoid tissue and epithelial structure; damage to the blood-forming organs and reproductive cells, and initial lymphocytopenia followed by a fall in granulocytes and, from the third week on, aplastic anæmia.

There are four possible means of preventing or treating this syndrome. These include (i) the provision of adequate protection against these radiations, (ii) the use of specific preventive treatment administered *before* exposure, (iii) specific treatment given *after* exposure and (iv) symptomatic and supportive treatment of symptoms and signs after they have developed. In the present state of our knowledge the use of protective measures before exposure and of supportive and symptomatic treatment after infliction of the injury are the only procedures of any practical value, and specific treatment directed towards correcting the fundamental injury is

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still under experimental study. But because research may produce at some time a specific agent of great clinical value in the treatment of these cases it may prove interesting and profitable to review a few of the objects of current animal investigations in this field.

It is thought that a very basic effect of ionizing radiation on living tissue is the production of active oxidixing agents such as hydrogen peroxide from the water of the cells and body-fluids. These oxidizing complexes are said to react with the sulfhydryl (SH) groups which are of such great importance to the activity of many enzymes; and so it has been postulated that, were we to "buffer" these SH radicals by the administration of compounds containing the same radical, the effects of irradiation could be reduced. Some investigators, using compounds such as glutathione and cysteine, have improved the survival times and rates when these substances have been given before exposure.

The foregoing is an example of an attempt at specific pre-treatment. One of specific post-treatment is as follows: several workers have shown that radiation produces certain histamine-like effects and have found high histamine levels in the blood of animals investigated. By treatment with anti-histaminics some improvement in the mortality rates of the animals has been gained. Another example of specific post-irradiation treatment is the exhibition of anti-heparin agents on the theory that the hæmorrhagic manifestations of the syndrome are due to the production of excessive amounts of heparin.

An interesting and promising line of work has risen from the observation that necrosis, thinning, and ulceration of the intestinal epithelium follow quickly upon the infliction of total body radiation. Such an injury permits toxic products and living organisms to gain access from the bowel through the damaged gut-lining to the general circulation, and thus to make a serious contribution to the symptomatology, pathology and mortality of the syndrome. The administration of antibiotics which will control such infections has been shown to improve the animals' reactions and mortality rates.

That inhibition of the functions of the endocrine products of the adrenal cortex contributes to the clinical picture of acute radiation illness seems well established and good effects have been reported from the administration of desoxy-corticosterone acetate and somatotropic hormone.

Further promise is found in reports of benefit following injection of splenic extracts and of bone marrow substance.

The preceding notations are offered, not only for interest's sake but also to show that we should be prepared for the acceptance of specific therapies even though at the moment we cannot avail ourselves of them at clinical level. Within the axes of reference of practical therapeutics we have six aims: they are (i) rest and nursing care; (ii) maintenance of fluid and electrolyte balances; (iii) adequate nutrition; (iv) control of infection; (v) control of hæmorrhage; (vi) treatment of anæmia. Before considering these aims, however, we should examine the preventive possibilities offered by the effects of shielding and distance.

Shielding against radiation is familiar to every physician who has watched a radiographer work from behind a lead screen. Every material, including air itself, has a specific shielding-value against the electro-magnetic radiations from an atomic bomb. This specific value is expressed as "half-thickness"—that is, that thickness of a material which will reduce the quantity of radiation impinging on it and passing through by 50%. The half-thickness value for a dense material like lead against gamma radiation is about half an inch, for concrete, about 3½ inches and for sand and earth about 7 inches.

Those persons who are sheltered in basements, heavily constructed buildings or even in ground-hollows would gain at least some protection against ionizing radiation, perhaps enough to make the difference between serious injury or death and otherwise. Besides this general shielding of the body, there are possibilities for local shielding of highly radio-sensitive regions, notably the upper abdomen: it has been found in animals that protection of the spleen during irradiation is followed by a lowered mortality. But of the practicability of localized body-shielding the writer is not prepared to judge.

The severity of the clinical reaction varies approximately with the dosage inflicted. It is highly probable that most persons who receive 500 roentgens or more of gamma radiation at a single dose (*i.e.*, within a minute or less) will die; that those who receive 400 R in the same manner will have a 50% chance of survival and if surviving will be seriously ill; that those who receive between 200 and 300 R will be ill and some will die; those with less than 200 R but more than

100 R will be mildly ill, and that those persons who get 100 R or less will show no symptomatic evidence of the injury inflicted. A discussion of the possible means of calculating dosages is not within the scope of this paper, but two points should be noted; first, that the most satisfactory present means of determining dosage is by the use of the instruments of one sort or another carried on the person; and second, that survivors who were unshielded at the time of the blast and within 2,000 yards of ground-zero will require evacuation, even if they present no thermal or traumatic injury; while those at distances beyond 2,000 yards—2,400 yards will probably need no treatment.

By whatever means dosage may be estimated, survivors of 400 R dosage or greater will be very ill and will need early, full-scale treatment. Treatment for cases which have had lesser dosages should be governed by the clinical condition, but it must be realized that persons who are asymptomatic after smaller dosage should not be re-exposed for weeks or months and then only if clinical and laboratory assessments indicate normal health.

At this point we may examine the aims of supportive post-treatment and their application to cases of various degrees of severity.

Rest should be provided from the outset for all cases displaying early gastro-intestinal symptoms, malaise or weakness. Such cases should be evacuated as lying or sitting cases, should be bed patients for at least two weeks, and should be returned to full activity only after careful assessment. Cases presenting more severe symptoms must have more extended rest.

Maintenance of fluid and electrolyte balance is particularly important in the presence of vomiting or diarrhœa: indeed, emesis alone may be the chief factor in causing fluid and salt loss. It is therefore justifiable to take early measures to control this symptom and it has been suggested that wide use of such drugs as Gravol by exposed populations immediately after the explosion is a desirable "mass treatment" procedure. Any case that has lost much fluid by vomiting or diarrhœa should have electrolytes supplied orally as normal saline, saline-sodium bicarbonate or saline-glucose; or if this mode of administration cannot be tolerated, such solutions should be administered parenterally, as soon as possible. Under acute catastrophic circumstances it is unlikely that elaborate laboratory tests could

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be carried out and it is suggested, therefore, that solutions of the types indicated be given until there is no clinical evidence of dehydration and until the urine approaches normal volume and specific gravity. Of course if hospital facilities are available more accurate methods of control should be exploited.

Nutrition may prove a very great problem. We have seen that the intestinal mucous membrane suffers early and severe damage, for which reason a bland diet, if possible, is indicated from the beginning. Neither the patient nor his attendants should be deceived by the relatively symptom-free latent period during which time a coarse diet of field-rations could aggravate the damage already inflicted on the gut. This consideration, however, should not be taken to imply that food of unsuitable texture should be withheld if none other is available, for it is known from observations in the laboratory that animals fed immediately after radiation show more satisfactory survival rates than those that are starved. If anorexia is extreme or if the stomach cannot retain satisfactory amounts of food and drink, intravenous administration of saline and glucose becomes necessary. There appears to be no particular advantage in a high protein diet given by mouth, though this qualitative condition has been recommended.

At what time after exposure efforts to anticipate or control infection should be begun, has not yet been decided. Further, beyond the fact that antibiotic therapy is the method of choice, no decision has been reached as to what particular agent or combination of agents should be used. A recommendation that has had wide acceptance is that penicillin in oil (400,000 units) should be administered intramuscularly every second day as a prophylactic measure, beginning on the third day. Penicillin, of course, has several disadvantages: it is not a "wide-spectrum" antibiotic, many persons have become sensitized to it and resistant strains of organisms may develop; so that this recommendation may be modified in the future. It should be remembered that suitably chosen sulfonamides may be valuable. If processes such as broncho-pneumonia develop, anti-infection treatment must be reinforced and modified to combat the particular organism involved.

Control of the hæmorrhagic manifestations of acute radiation syndrome is a complex problem, for the etiology is a multiple one—damage to

capillary walls, inhibition of the humoral clotting mechanisms, platelet-depression and the possible excessive production of heparin-like substances are among the factors suggested. The administration of fresh whole blood appears to be the best treatment for hæmorrhagic manifestations but, (in catastrophe especially) difficulties of supply would prove troublesome. Earlier writers have recommended the routine administration of whole blood at five-day intervals from the inception of the illness; this concept has been modified by other authorities who favour withholding blood until definite hæmorrhagic signs become evident, and still others recommend administration of a single large transfusion—say 1,500 c.c.— at the onset of bleeding. The supporters of these latter procedures consider that they will lessen the danger of undesirable reactions from repeated tranfusions and that they will also decrease the unnecessary expenditure of badly-needed blood. It should be remembered that the present tendency is to recommend that the administration of blood should be withheld until hæmorrhagic signs are definite; the appearance of a few purpuric spots or of a little melæna in the third or fourth week of a mild case are not, for example, a strong indication for use of blood.

This survey should not close without laying stress on the importance of observational and expectant treatment. Considerations of medical man-power would demand that nurses, nursing aids and other attendants charged with the hourly care of atomic bomb casualties assume grave responsibility and that they be watchful for early indication of radiation sickness. They should watch for characteristic symptoms and signs—loss of appetite, sores in the mouth, painful throat, nausea, loose stools and melæna. Sudden loss of scalp hair, and gross ulceration of the buccal and pharyngeal structures are later and more obvious signs which anyone would notice; but attendants should know the earlier indications and observe carefully traumatic and thermal cases who "are not doing well"—in such patients radiation-injury can be a most serious complication at relatively-low dosage levels and should receive prompt and thorough attention.

Though these remarks have been limited to the treatment of the effects of ionizing radiation inflicted on the organisms from a source outside it, a few words should be added regarding a second hazard, *viz.*, that of internal radiation. When a bomb is exploded at or near ground sur-

face (low burst) there is produced heavy radio-active contamination of the ground itself. This activity continues for months and can be power-ful enough in the earlier phases to inflict general damage by gamma emanations and skin-burns by beta-particles. But the radioactive "dirt" can gain access to the body by ingestion, by inhalation and through open wounds; and if the radio-elements which gain access happen to be among those which (like plutonium, uranium and strontium) tend to lodge in bony tissue, the long-term effects on the skeletal and hæmopoietic systems can be serious indeed.

So far no satisfactory treatment for "internal contamination" has been devised. In animals the excretion-rate of plutonium has been hastened and the storage-rate in bone decreased, by admin-istration of zirconium acetate and of complexing agents—e.g., versene—soon after injection of the radioactive substance; but the present practical approach to this problem is entirely preventive. Ingestion must be prevented by avoiding the use of contaminated water and food; inhalation by use of respirators; and contaminated body-surfaces cleansed by adequate measures, at decontamination centres.

These principles could be applied at the various levels in the evacuation chain as follows:

For first aid in the disaster area it is recom-mended that the casualty be given rest and transportation to a first aid station. Anxiety should be allayed and fatigue and exposure avoided. Even the most trivial wounds should be protected against infection because of the patient's lowered resistance. Because of the effects of distance and shielding on the size of the dose inflicted by an atomic burst, the *location* of the casualty should be noted accurately on the emergency medical tag.

At first aid stations vomiting should be con-trolled by Gravol or by other suitable drugs and electrolytes administered by mouth or intra-venously if necessary. The recommended solu-tion for intravenous administration is 5% glucose in normal saline, and for oral use one teaspoonful of salt and one-half teaspoonful of baking soda to each quart of water. No fluids should be given by mouth to people with facial injuries involving the mouth or swallowing mechanism or to people with abdominal injuries. Sedatives may be indi-cated at this level, either orally, hypodermically or intravenously. Barbiturates will be available for oral administration and sodium pentothal

for intravenous use. The casualty should be evacuated to a rest-centre for observation as a lying or sitting-case. If symptoms of radiation sickness develop at such centres he should be referred for medical treatment.

At emergency hospitals treatment for vomiting should be continued if indicated. Electrolyte solutions will be available and for urgent cases blood and plasma could be supplied. Barbiturates and sodium pentothal will be the available sedatives. If hæmorrhagic signs develop whole blood can be given. Patients who have been exposed to radiation should be given 400,000 units of penicillin in oil (procaine penicillin G 300,000 units per millilitre with crystalline penicillin G 100,000 units) every second day, beginning on the third day. Later streptomycin or a broad spectrum antibiotic (such as terra-mycin or aureomycin) can be added if necessary. These broad-spectrum antibiotics are considered to be interchangeable and will be available in 250 milligram capsules for oral administration. The recommended daily dosage of streptomycin is one gram intramuscularly, preferably in two doses.

Summary

While some promise of specific therapy has been given by certain experimental approaches no such preventive or remedial treatment for acute radiation syndrome has been developed to the point of clinical application. For preven-tion we must rely on the physical principles of dis-tance and shielding; for treatment on supportive measures applied according to the amount of radiation inflicted and (later) according to the patient's condition. Observational care is of great importance to casualties surviving atomic-bomb attack, all the more because the added insult of radiation-injury may impede recovery or cause death in cases suffering from trauma or burns.

References: The current literature on this subject is too extensive to summarize here. The following publications will be found useful:

(1) Atomic Medicine, Edited by Charles F. Behrens, Thomas Nelson & Sons, 1949.

(2) Health Services and Special Weapons Defense. U.S. Government Printing Office, Washington, D.C., December 1950.

(3) The Effects of Atomic Weapons. Superintendant of Documents, U.S. Government Printing Office, Washington, D.C., June 1950.

(4) Sourcebook on Atomic Energy. Samuel Glasstone, D. Van Nostrand Company Ltd., 1950.

MEDICAL ASPECTS OF CIVIL DEFENCE IN BIOLOGICAL WARFARE

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Introduction

The term "biological warfare" is used in preference to "bacteriological warfare" or "germ warfare" in order that it may include the use of pests, parasites and hormones as well as bacteria and related micro-organisms.

The lay press and national magazines have carried extensive accounts of "germ warfare" in recent years so that the public is well alerted to the possibilities of this type of warfare. It has not been established that biological agents have been used in modern war and thus it is very difficult to determine how effective they would be. Considerable scepticism has been expressed by some authorities as to the possibilities of biological warfare, claiming it would have little if any value as an offensive weapon, while others have maintained that it would be even more devastating than the atomic bomb. The pandemics of disease like the black death (plague) of the fourteenth century and influenza of 1918-19 provide direct evidence of the cataclysmic effect of such events. It is because of this uncertainty that biological warfare must be assumed to be a formidable method of attack until it is proved otherwise and every effort made to render an attack, if delivered, as ineffective as possible. It is probable that the extensive preventive measures taken before and during the 1939-45 war against chemical warfare had a very important bearing on the decision of the Germans to withhold the use of gas. Thus preparedness seems advisable.

It might be well to outline very briefly the achievements of research projects on biological warfare during the 1939-45 war. These were outlined in an address by Mr. George W. Merck, Special Consultant to the Secretary of War, U.S.A., at Pittsburgh, Pa., May 16, 1946. They were the result of work done by groups in the United States and by their British and Canadian allies. In general terms the following were some of the chief accomplishments.

"1. The development of methods and facilities for the mass production of pathogenic micro-organisms and their products. This involved the

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prevention of contamination of air, water and land surrounding the experimental stations.

2. The development of methods for the rapid and accurate detection of minute quantities of disease-producing agents.

3. Significant contributions to knowledge of the properties and behaviour of air-borne, disease-producing agents.

4. For the first time, a pure crystalline bacterial toxin was isolated and studied. This was the toxin of Clostridium botulinum type A, which is the most potent biological poison known to man.

5. The development of vaccine for the protection of chickens against two highly fatal poultry diseases known as Newcastle disease and fowl plague.

6. Advances in the treatment of certain infectious diseases of mammals, including man. This resulted from a few cases of disease attributable to laboratory accidents, all of which were treated successfully.

7. The development and large-scale testing of a vaccine for the protection of cattle against rinderpest, a highly fatal disease of cattle.

8. Extensive studies on the production and control of diseases which might affect crops of economic importance.

9. Information was obtained regarding the effect of more than 1,000 different chemical agents on living plants."

Mr. Merck pointed out that "these investigations and the revelation of their inherent quality of producing not only weapons and defences, but also fundamental advances of knowledge and practical contributions to medicine and agronomy, have necessitated the writing of a new chapter in biological science."

Active research is proceeding into the means of defence in order to be prepared in the event of an attack. Such research will add to fundamental medical knowledge and have an application in peace-time.

The fundamental principles of biological warfare are no secret and the information given in this paper has appeared in lay and technical publications. References to these publications has been extensively made and liberal use made of their contents.

Definition

Biological warfare may be defined as the offensive and defensive military use of disease, famine and pestilence, produced by means of bacteria, viruses, rickettsiæ, fungi, insects,

hormone-like chemical substances and other agents. It is the production of death or disease on a mass scale in men, animals, and plants under conditions which do not exist in nature. This discussion deals only with biological warfare against man.

Characteristics of Biological Warfare Agents

The number of organisms that can produce or carry disease is very large but it is well known that not all of these are suitable for biological warfare. It is generally agreed that agents capable of being employed should have the following characteristics: a high degree of virulence and thus a high capacity to produce infection so that small doses will be effective. They must have the power to produce a disease which is either lethal or cause incapacitation for some time. They must possess stability to ordinary temperatures and to destructive forces. For dissemination in the air they must be able to withstand the effect of sunlight and of drying. It has been found that rapid freezing, drying and storage under high vacuum will preserve the viability and virulence of many types of micro-organisms for long periods of time. This is a common method of preserving micro-organisms in bacteriological laboratories. They must be suitable for effective dissemination and not necessarily by the usual route of transmission. Laboratory accidents have shown that many micro-organisms can produce disease when they gain access to the body other than by the normal means. Equine encephalomyelitis, ordinarily transmitted by a mosquito, has produced disease when inhaled. Diseases transmitted by unnatural routes may resemble the natural infection or may have a different set of symptoms and thus delay diagnosis. Micro-organisms must be capable of production in large enough quantities to serve the purpose. There is a number of examples of the large scale production of micro-organisms for beneficial purposes. The production of the broad spectrum of antibiotics from fungi is a case in point. In certain circumstances, such as a limited objective, relatively small quantities of the agent would be required. In order not to be detected by the usual physical senses the aerosol containing the agents should be devoid of colour, taste or odour. An ideal agent would be one to which the attacked population would be very susceptible, against which it would be difficult to produce an immunity and

capable of producing a disease presenting marked difficulties in treatment.

It is not possible to predict what agents might be used, but keeping in mind the above characteristics there are certain possibilities. In the virus field those producing influenza and psittacosis; of the rickettsiæ, those causing Q fever and the typhus fevers; of the bacteria, those causing cholera, plague, anthrax, tularæmia, brucellosis, or the enteric fevers; of the fungi, possibly that causing histoplasmosis; and of the non-viable biological toxins, those producing botulism or tetanus. A combination of agents could be used which might produce a very confusing clinical picture.

It must be kept in mind that a determined enemy might employ an agent completely unknown to this part of the world, and by an unusual route of transmission, which might produce quite a difficult problem in diagnosis.

Routes of Dispersion

It is reasonable to suppose that, for the intentional dispersion of pathogenic agents to man, one of the principal routes would be by some air-borne method; thus inhalation would be the mode of infection. This could be done by introducing the agents into air-conditioning systems of buildings or plants or by dispersal into the air over a given area.

The micro-organisms or agents could be added to drinking water, which in turn could contaminate food. They could also be added to milk and other foods, but these methods seem less likely, except under special circumstances.

They could also be added to drugs, or to cosmetics, or on money, leaflets, and paper.

Methods of Dispersal

Biological warfare agents may be disseminated on a large scale using air-burst bombs, or on a small scale against a specific object by saboteurs. The use of spray from aircraft does not seem feasible since the aircraft would be forced to fly at such heights that much of the infective material would be dispersed by air currents before reaching the ground. It is a possible method when low-flying aircraft could be employed.

In the case of the use of air-burst bombs, clouds of air-borne micro-organisms would drift down and diffuse over a wide area, which would result in possibly only a few living pathogens in a given area. Even a small number

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of pathogens might be capable of initiating an outbreak of disease. As well as the original cloud there may also be a secondary cloud after the primary one has passed. Micro-organisms settling on clothing, bedding, carpets, clothes, etc., might be disturbed on shaking, brushing, sweeping and thus produce a secondary cloud. This would contain a lower concentration but still might be capable of initiating trouble.

Sabotage might be employed and thus the dissemination of pathogens by this method would be on a smaller scale than by air-burst bombs. Perhaps the greatest danger of sabotage would be the infection of an urban water supply, causing wide-spread and rapid dissemination. This would be particularly dangerous if the agent were added after filtration and chlorination had taken place. A saboteur need not depend on an outside source for supply of material. Many pathogenic bacteria can be grown in simple media and without very much equipment. Such an enterprise might even be carried out under the guise of research. (A saboteur with a few vials of dry culture and some kitchen equipment could, in some instances, produce a large quantity of potent material.)

The Possibilities of Biological Warfare

The direct effect of biological warfare is extremely difficult, if not impossible, to assess. It might produce casualties varying from very mild illness to death. Indeed, it might be the aim of the user of this form of warfare to produce incapacitating illness rather than a large number of deaths since this would tax the medical and health facilities to a greater capacity. As mentioned earlier, competent persons have claimed that biological warfare can never be a serious threat; others, presumably equally competent, claim that its possibilities are greater than the atomic bomb. Whatever view one takes will be based on judgment rather than on actual experience. There is considerable experience available on which to base a judgment, namely epidemiological experience with animals, a growing body of experience with accidental infections in laboratory workers, and the broad experience of the behaviour of communicable disease under natural conditions. This experience indicates that biological warfare is a distinct possibility.

Mitigating Influences

Assuming that casualties will occur, there are several factors which will limit the number of persons who might become ill or the number of secondary cases that will occur as a result of exposure to those initially infected. Firstly, many of the agents which appear to best meet the requirements of biological warfare do not spread from person to person. Secondly, in many natural disease outbreaks there are exposures that fail to produce disease. There are the so-called "subclinical infections" which may result in immunity. Diphtheria is an example of this. Thirdly, a certain degree of immunity is possessed by many people against many of the communicable diseases. This is difficult to measure but aids in the natural control of these diseases. Some acquire such an immunity naturally, and often unrecognized, as in poliomyelitis, and others by artificial immunization, as in the case of smallpox. This raises the point of active immunization against those diseases for which satisfactory antigens are available and will be dealt with subsequently under the heading of mass immunization. Fourthly, it would seem difficult to deliver the optimum dose to a given area as the optimum dose in biological war is not known from actual experience. Further, there are the factors of wind, rain, temperature, and sunlight which would affect the successful dissemination of an agent and these are beyond control. Finally, and possibly the most important reason for the presentation of this subject, is the fact that with adequate preparations taken in advance and proper action taken after an attack based on the peacetime control of communicable disease the number of casualties as the result of biological warfare will be reduced to the minimum. Thus preparedness in the preventive aspects of defence becomes of prime importance.

The Defence

As the use of biological warfare by a potential enemy may depend, to a great extent, on the state of preparedness, defence precautions are a very important aspect of the problem. The defence precautions against chemical warfare in the 1939-45 war may have been the chief deterrent against its use by the Germans. It might be possible, with every means of defence fully and efficiently employed, that the efficacy of biological warfare as a weapon of mass destruction or incapacitation would be so markedly reduced that its employment for that purpose would not be worthwhile.

Detection and Identification of Biological Warfare Agents

Civil defence against biological warfare should aim at preventing the occurrence of casualties. Since it is assumed, from our present state of knowledge, that there will be casualties, then our efforts must be directed towards minimizing the effects. This would include limiting the number of casualties to the minimum, shortening the period of incapacitation, reducing or preventing deaths and preventing the development of secondary cases. These are essentially the objectives of the peacetime activities of the health departments together with the part played by the practising physicians in the control of naturally-acquired diseases. The primary responsibilities for the co-ordination of the control of communicable diseases in peace-time devolves upon the public health authorities. In the organization for civil defence, arrangements have been made for the departments of public health to have charge of the defence against biological warfare.

The routine testing of water, milk and foods is an accepted procedure in determining their fitness for human consumption. The sampling of air to determine the dust content is also a well-established practice. The testing of air for the bacteriological content has been largely experimental. The detection of biological warfare agents would be extremely difficult. When dispersed they cannot be perceived by any of the human senses and they do not lend themselves to detection by chemical indicators or detectors of any kind. This situation calls for the adaptation of our accepted methods of sampling and testing to meet an attack if and when it is employed. The lay magazines have carried illustrations of air samplers and filters which trap bacteria and permit their identification within 15 hours. Sampling stations could be set up to determine the normal bacterial flora of the air in any given area and in the event of a change in the flora, or a sudden increase, the early detection of an attack could be achieved.

The bacteriological analysis of water, milk and foods could be extended in scope in order to give more evidence than the present methods provide for the detection of intentional dissemination.

The methods of detection commonly employed have serious limitations. The cultivation of most bacteria on artificial media for successful identi-

fication is a matter of several hours, even days. The isolation of the viruses and rickettsiæ requires animal inoculation or the use of the embryonated egg and this usually entails several days before the identification is complete. The non-viable soluble exotoxins of bacteria require time-consuming animal tests for identification.

Furthermore, it is not known whether the methods of isolation presently in use would be effective in collecting sufficient material for identification, even though agents were present in sufficient number to produce disease in humans.

Despite all these limitations there is reason to believe that our presently-employed methods of isolation and identification would provide a ready answer to most problems. Research in such problems should be counted on to further augment our knowledge. One of the most pressing problems is the development of more rapid methods of detection.

The Rôle of the Physician

One of the most important aspects in the control of an outbreak of disease is the recognition of its presence in the earliest stages. The first evidence of biological warfare may be the occurrence of disease or the developing signs and symptoms resulting from exposure. Cases may develop before it is recognized that an attack has occurred. Therefore the practising physician will have an extremely important part to play in the early detection of an attack. The physician will be aware of the type and number of cases which have been occurring in the area, and the sudden appearance of a new type of disease, or cases presenting unusual signs or symptoms, or a sharp increase in the number of cases should arouse suspicion of something out of the ordinary. There may be only one suspicious case in the first instance seen by any one physician. When there is reason to suspect that an outbreak of disease, or even a few isolated cases, might be the result of biological warfare, prompt notification to the local health authority is a prime essential. In this way it becomes possible to institute large-scale investigation, and, if necessary, to introduce control measures. It will be seen that the reporting of communicable diseases to the health department by the family physician takes on an added significance. The more completely the reporting is carried out before an attack the more pertinent subsequent information will be. Prompt reporting is also essential, and it may be neces-

sary to use more rapid means of communication than is ordinarily employed. A medical profession alert to the possibilities is an important asset in the defence against biological warfare.

The health authority may be suspicious of the use of biological warfare as the result of information received from sources other than the family physician. Absenteeism from schools or industrial plants often is a good index of an outbreak of a communicable disease in peacetime and could provide evidence of an attack. The admission of an unusual number of cases to hospitals and clinics would also arouse suspicion. Thus the health authority, by close scrutiny of communicable disease reports, together with information from other sources, should be suspicious that an attack has occurred.

Prevention of Casualties

It is logical to think of taking measures beforehand to prevent casualties, such as mass immunization, or immediately after the attack to reduce the extent and degree of exposure.

Mass Immunization

There are some very effective antigens available, such as diphtheria toxoid, tetanus toxoid, yellow fever vaccine, smallpox vaccine and others, with which it would be possible to protect the population by widespread immunization. For solid protection it is necessary to give not only the initial series but in most instances "booster" or reinforcing doses. There are diseases against which an effective antigen for active immunization is not yet available. There are many problems in advising a scheme that is practicable. Assuming that one used the known effective antigens, this would entail a series of initial injections, with repeated booster doses, which would create an administrative problem. This is not beyond the realm of possibility, as evidenced by the mass vaccination program against smallpox which was carried out in New York City in 1947 when over six million people were vaccinated within a month. There is also the experience in the armed services, during and subsequent to the 1939-45 war, of large scale immunization with a multiplicity of antigens, which has been extremely effective. The story of the control of tetanus in the allied armies in the last war by the use of toxoid is one of the most dramatic events in the medical history of the armed services. There were two cases of tetanus in the Canadian Army overseas, 1939-45, without a

single death. There is a mixture of five antigens in extensive use at the present time which has been found to be efficacious and devoid of undue reaction in the recipients. It is a difficult problem on which to give clear-cut advice, but serious consideration should be given to the use of active immunization of the civilian population if attacks from biological warfare are anticipated.

Disinfection

The methods employed for the disinfection of areas contaminated by biological agents will depend on whether the agents employed are of the persistent or the non-persistent type. Persistent agents are almost invariably of the spore-bearing type and these micro-organisms can remain dormant, yet viable, for very long periods of time (in some cases, years) and under conditions in which non-persistent types of micro-organisms would die rapidly. The persistent agents must be subjected to very drastic treatment (such as prolonged heating or burning) in order to destroy them, whereas the non-persistent types are killed by a variety of means including exposure to the weather.

The disinfection of a water supply contaminated by biological warfare could be carried out by the application of peacetime procedures such as filtration, chlorination and, in an emergency, boiling as well. The biological toxins are usually destroyed by boiling, so that if any of these agents have been employed then boiling for at least ten minutes becomes a necessity.

The methods of disinfection of surfaces, clothing, boots, and vegetation will depend on whether the agent was persistent or non-persistent. For the non-persistent types the standard methods of scrubbing, washing, immersion in suitable disinfectants and exposure to the sun and air will be applicable. For the persistent types the disinfection of clothes and various articles in a proper apparatus with prolonged heat will be necessary, or it may be necessary to resort to burning or very deep burial.

Handling of Exposed Persons

The effects of an attack may be limited in two ways. Those persons known, or presumed, to have been exposed to the attack, and not yet sick, may be protected from developing the illness, or the severity of the illness may be reduced, by giving prompt treatment in the incubation period with appropriate specific agents.

In some instances antitoxin might be employed, and in others a suitable antibiotic.

If an agent has been used which is highly communicable, and thus capable of being spread from person to person, the accepted methods of isolation, quarantine and disinfection should be invoked in an effort to prevent secondary cases or epidemics.

Personal Protection

The respirator, protective clothing, ointments and shelters have been developed as a protection against chemical warfare. Similar devices with proper adaptations could give protection against many of the biological warfare agents. The respirator is the primary protection against air-

borne infection and should be kept in good condition.

Health Departments

The local, provincial and federal departments of health will have an important part to play in co-ordinating and contributing to the defence against biological warfare. It is not the purpose of this discussion to outline in detail the rôle of each of these departments, and reference to the schematic outline below will show the interlocking arrangements at the various levels. In brief, this system of defence will be a development of the peacetime program for the control of communicable diseases. Immediately evidence comes to hand that an attack might have been

EXISTING AND SUGGESTED CHANNELS FOR REPORTING COMMUNICABLE DISEASES [C. D.]
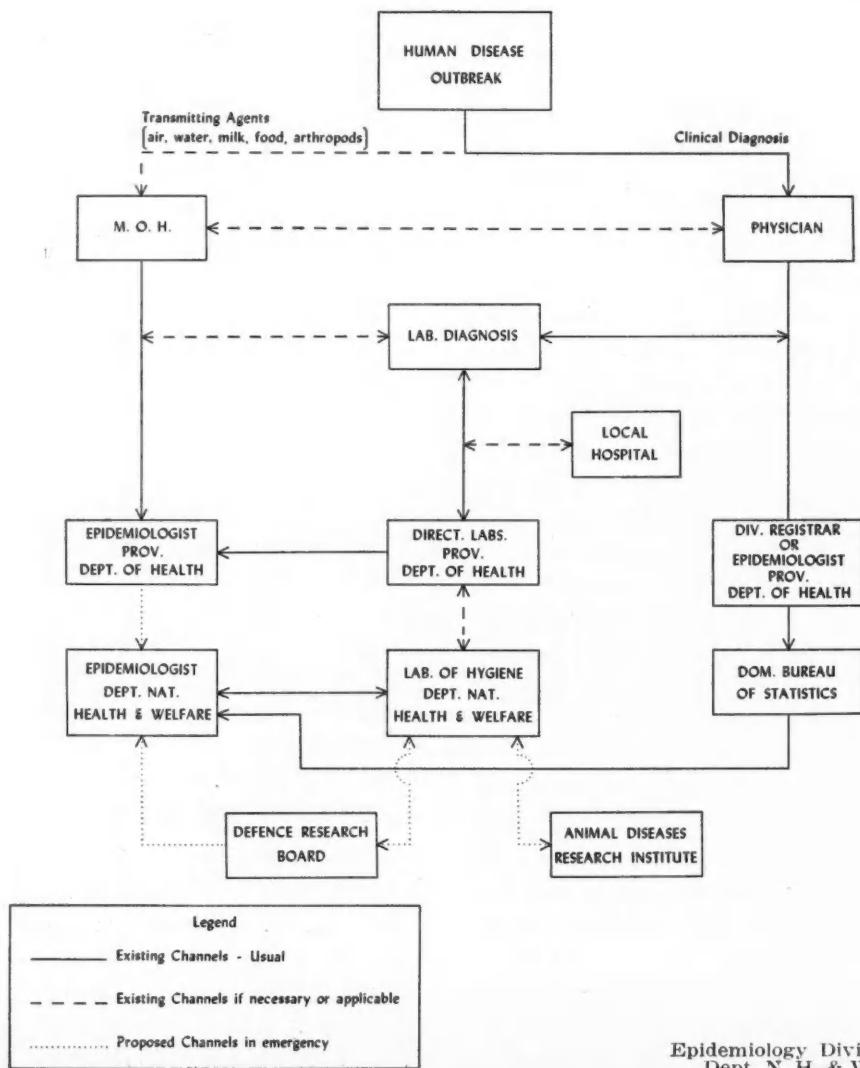
Epidemiology Division
Dept. N. H. & W.

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delivered, a very thorough and careful investigation will be required by the health authority. Such an investigation would combine clinical, epidemiological and laboratory investigations. The investigations would endeavour to determine whether an attack had been made, the causative agent or agents employed, what method of dissemination had been used, and the area and degree of contamination. This will require the organization of those presently engaged in the peacetime control of communicable disease since it will not be possible to allocate special groups for exclusive duty in connection with defence measures against biological warfare. The local laboratories in health departments, universities, hospitals and scientific institutions should be organized to function within the limits of their competence, and regional centres having specialized skills and equipment set up to enable complete identification to be carried out. The proper briefing of such personnel is an important part of the scheme.

The Department of National Health and Welfare, in its current planning for defence against biological warfare has, as one of its objectives, the training of key personnel with regard to general policy and the operational and technical responsibilities on a federal level. In turn, the provincial and local departments of health can arrange for the proper briefing and training of local personnel so that in the event of an attack a well-organized plan is in readiness. The old maxim, "Eternal vigilance is the price of safety", should be kept in mind.

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MEDICAL ASPECTS
OF CHEMICAL WARFARE

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The modern history of the use of chemical warfare agents dates from the first World War when the Germans introduced chlorine gas in an attack in 1915. Before the termination of that conflict both groups of belligerents had employed a variety of chemical agents, the most effective of which was mustard gas. In the second World War both sides were prepared for the possibility of chemical attack and had stockpiled all the standard agents. Scientific teams sent into Germany by the Allies at the close of hostilities discovered that the Germans had developed a new and highly toxic series of agents which, because of their specific action on the nervous system, were named "nerve gases."† It is considered today that although any one of a number of toxic chemicals might be employed on a small scale in local sabotage attempts or in a harassing rôle, a generalized, full-scale chemical attack would see employment of *Nerve gases*, and possibly also of *Blistering gases* of the mustard gas type. The following discussion will, therefore, be confined to a consideration of the symptomatology and treatment of casualties resulting from exposure to agents of these two groups. However, teams of specialists familiar with the treatment of casualties resulting from all known types of chemical warfare agents will be available in the major centres across the country.

The Nerve Gases

The nerve gases are a group of organic phosphorus compounds, liquid at room temperature and essentially colourless and odourless. They exhibit a high lipoid solubility and are also soluble in water in which they are hydrolyzed; the decomposition is particularly rapid in alkaline aqueous medium. These compounds are highly volatile and the vapours are extremely

*Formerly Defence Research Board, now Industrial Health Laboratory, Ottawa.
†Not to be confused with HCN, CO and other gases which also have been referred to in earlier literature as "nerve gases".

toxic when inhaled or when they come in contact with mucous surfaces. The liquid nerve gases in the form of fine droplets may be inhaled and coarser droplets are readily absorbed through the skin, and particularly so through burned or wounded areas. The most striking characteristic of this group of agents is the rapidity of action, a lethal dose killing in a few minutes.

Nerve gases possess the property of irreversibly inhibiting enzymes of the cholinesterase group and it is believed that the effects which they are capable of inducing can be attributed exclusively to this fundamental biochemical action. Cholinesterase activity is manifested normally at central synapses, at preganglionic endings of the sympathetic nervous system, at postganglionic junctions of the parasympathetic division and at myoneural junctions of skeletal muscle. The cholinesterases are responsible for the hydrolysis of acetylcholine, the chemical mediator of impulse transmission at these sites. In nerve gas poisoning, the inhibition of cholinesterases leads to an accumulation of acetylcholine and the development of acetylcholine intoxication. Thus, nerve gases have a physiological action similar to, but more prolonged than, physostigmine. Most of the classical symptoms of both muscarine and nicotine poisoning ensue, and the excessive accumulation of acetylcholine at myoneural junctions results in a curare-like flaccid paralysis in severe cases. Furthermore, repeated exposures tend to be cumulative unless sufficient time has elapsed to allow for at least partial recovery of cholinesterase activity.

Symptoms

The nerve gases act with extreme rapidity and the severity of the signs and symptoms which develop depends primarily upon the amount of the agent absorbed. Following a minimal exposure to trace concentrations of nerve gas, the effects are confined to local action on the eyes and upper respiratory tract. The subject may complain of difficulty in seeing in a dim light, the result of a pupillary constriction which could last from one to three days. A mild intermittent bronchoconstriction, as indicated by a recurrent sensation of tightness in the chest, will be experienced by some individuals for a few hours. There may also be a moderate watery nasal discharge.

With a somewhat larger exposure to the agent, the onset of intermittent bronchoconstriction is very rapid and the condition is likely to persist

for several days. While the difficulty in breathing is harassing, the bronchoconstriction is not sufficient to produce hypoxæmia. A rhinorrhœa will also be seen in most cases. The meiosis will be severe and, in addition, spasm of the ciliary muscles of the eye will be marked. The resulting difficulty of accommodation is manifested by a moderate photophobia and pain when attempting to focus on near objects. The subject will probably complain of headache radiating frontally or to the occiput.

When the amount of nerve gas absorbed is approximately eight times the smallest dose capable of eliciting any detectable effects, the intensity of the symptoms may prove incapacitating in many cases. Bronchoconstriction becomes almost continuous and mild anoxæmia can be detected; the individual will be confused and panicky and will experience a sensation of suffocation.

Still larger exposures will be completely incapacitating and interference in respiration is further complicated by central and peripheral effects, a consequence of systemic absorption of the agent. Initially the bronchoconstriction is so severe that the respiratory tract may be nearly closed. Laryngeal spasm and bronchorrhœa add to the great difficulty in breathing, and the subject may be seized with panic in his struggle for air. In spite of vigorous muscular effort, little ventilation of the lungs will be accomplished and the resulting anoxæmia may cause collapse and unconsciousness. The efforts of the respiratory muscles then decline because of (a) fatigue, (b) the effects of the anoxia of both the muscles of respiration and inhibition of the respiratory centre and (c) from a developing paralysis which follows the accumulation of acetylcholine at the myoneural junctions. The airway will now relax slightly and, since the respiratory paralysis is not complete at the dosage under consideration, the subject will likely possess enough muscular function to survive the anoxia. In the early stages, while the subject is conscious, the heart rate will be somewhat accelerated and the blood pressure elevated. Subsequently, however, when systemic effects of the absorption of nerve gas become established, there is a definite bradycardia and the blood pressure falls. As a result of the anoxia and the direct action of nerve gas on the central nervous system, muscular tremors develop followed by fibrillary twitchings and occasional clonic-tonic convulsions. A variety

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of muscarinic effects of the intoxication will also be manifest under these conditions of exposure; they include profuse salivation, intestinal hyper-motility resulting in nausea, vomiting, cramps and diarrhœa. Urinary incontinence and premature labour may also be seen.

With lethal doses of the agent, the clinical picture is similar to that of a severe casualty but the sequence of events occurs more rapidly. The initial blocking of respiratory passages of the airway is essentially complete so that anoxia with collapse and unconsciousness develops quickly. Despite some relaxation which now supervenes, spontaneous respiration fails because of paralysis of the accessory muscles of respiration and central inhibition. Tonic-clonic convulsions will be followed by a generalized flaccid paralysis. The bradycardia is extreme, often resulting in a sudden and complete arrest of heart action; this may be the terminal event. Massive salivation and incontinence of urine and fæces are the rule.

The signs of poisoning which develop after contamination of the skin and exposed areas differ little from those seen following inhalation of nerve gas vapour. Localized muscular twitching may be seen at the site of contamination, and meiosis generally will not appear except in severely poisoned cases. However, if the eyes are contaminated with liquid nerve gas, there is an intense meiosis and ciliary spasm. It should be remembered that poisoning may occur by ingestion of contaminated food or water.

Behavioural manifestations of central effects of nerve gas may become apparent in subjects surviving the severe functional derangements. In milder cases, there may be giddiness, tension, anxiety, insomnia and excessive dreaming. With more severe exposure, withdrawal, depression, restlessness, tremor, emotional lability and irrational behaviour may be seen.

Treatment

The Civil Defence organization recognizes three levels at which treatment may be undertaken: self-help, first-aid, and hospital treatment; discussion of the treatment of nerve gas casualties will be considered from this point of view.

Self-Help

It is the responsibility of the individual to carry out personal decontamination and to fit and remove his respirator as indicated below. Since any high explosive attack may be combined with the use of chemical warfare agents, each person should fit his respirator as soon as he is aware that such an attack is in progress. It is especially important that the respirator be worn in the presence of any unidentified object emitting smoke or mist. If the individual is splashed with droplets or sees any gross liquid contamination on his person he should remove excess liquid by daubing and immediately carry out personal decontamination. All outer clothing except the respirator must be removed and discarded outdoors. The affected individual should proceed to a sheltered, uncontaminated area and remove the balance of his clothing, including the respirator. He should then wash thoroughly in running water but avoid rubbing the skin. The following materials should be applied to the contaminated areas in order of availability: bleach slurry or household equivalent such as chloride of lime solution, Javex, javel water, washing soda or baking soda. He should then sluice off with clear water, dry and dress in clean clothing. It must be emphasized that speed in carrying out the steps outlined above is most essential because of the rapidity of action of nerve gas.

First-Aid

While the procedures outlined above may be carried out by the individual if he is within a short distance of his home, he may be within range of a decontamination centre where not only the above steps but certain first-aid measures may be performed. Both non-medical and medical personnel will be available in first-aid stations to which the decontamination units are attached. The immediate administration of atropine intramuscularly will help relieve the central and muscarinic actions of nerve gas. The dosage employed will depend on the severity of the symptoms exhibited and will range from one injection of 2 mgm. to counteract paroxysmal bronchospasm up to three injections or more in the case of casualties exhibiting severe bronchospasm and cyanosis. A thorough atropinization of the patient is desired, and it must be remembered that the patient's tolerance for large doses of atropine is markedly elevated in nerve gas poisoning. The immediate use of atropine is only contra-indicated when the subject has undergone a profound and prolonged anoxia; under these circumstances, the administration of atropine

may suddenly release the heart from vagal control and, in the presence of the severe anoxia, the attendant increase of the work of the cardiac muscle would almost certainly lead to ventricular fibrillation and death. Thus, in severely anoxic cases, artificial respiration should be undertaken until the lungs have been ventilated and the heart has made a partial recovery from its anoxia before atropine is administered. Holger-Nielson, or in applicable cases the Emerson method, is recommended because procedures such as the Schaefer prone pressure method, which depend upon the elastic recoil of the lungs, will be useless in patients suffering from flaccid paralysis of the respiratory musculature. A pulmotor and iron lung may be used if available.

Hospital Treatment

Additional treatment may be indicated in the case of patients exhibiting clonic and tonic convulsions and also in the case of those suffering intense pain and headache as a result of severe meiosis and ciliary muscle spasm.

In the case of the ocular effects, systemic atropinization may not be effective in producing relief and should be supplemented with local therapy. Mild cases will respond to the ophthalmic administration of homatropine; severer cases may require repeated instillations of atropine until good mydriasis is obtained. Convulsions may be controlled with thiopental, tridione or ether anæsthesia. If thiopental is used, overdosage must be avoided as it acts synergistically with nerve gas in depressing respiration. Tridione will depress cortical activity without depressing respiration if administered intravenously up to a maximum dosage of 5 grams. The use of these therapeutic measures is best undertaken in hospital under medical supervision. It must be remembered that convalescence in a severely poisoned patient may take several weeks.

Blister Gases

The blister gases or vesicants include the mustard gas of World War I and the newer nitrogen mustards. These substances are oily liquids ranging in colour from pale yellow to dark brown and they possess characteristic odours resembling garlic, horseradish, shoe polish or spoiling fish. The blister gases are very soluble in the usual fat solvents, but are only slightly soluble in water in which they are slowly decomposed. Blister gases are classified as per-

sistent agents since it is possible to contaminate material and terrain for long periods with the liquids which slowly and continuously emit vapours.

Because of their high lipoid solubility, vesicants are readily absorbed by the skin and they exert a local cytotoxic action leading to the development of necrotizing lesions. The vapour rapidly attacks the eyes and the warm, moist skin of the perineum, axillæ, antecubital fossæ and neck. The inhalation of mustard gas vapour may result in damage to the respiratory tract. Damage to skin and eyes will be most severe after contamination with the vesicant in the form of liquid.

Symptoms

After contamination of the skin by either the liquid or vapour of blister gases, there is a latent period, ranging from 1 hour in the event of liquid contamination, to several days after mild vapour exposure. Erythema and œdema are followed by the development of vesicles due to liquefaction necrosis of the underlying epidermal layers. The typical mustard blister is large and domed, thin-walled, superficial, translucent, yellowish and surrounded by erythema. The blister tends to rupture but the fluid may be resorbed over the course of several days to a week. While there is no pain at the time of contamination with mustard, an itching or mild burning may accompany the development of erythema. If blisters do develop, the area may be painful.

The eyes are affected by even very low concentrations of mustard vapour. There is a latent period of 4 to 12 hours after a mild exposure, when the first symptoms of lachrymation and a sensation of grit in the eyes become evident. The conjunctivæ and lids become red and œdematous. If the exposure is more severe, the latent period is reduced and severe lesions of the eye may ensue. These include mild corneal involvement with superficial scarring and vascularization of the cornea. In very severe cases there will be necrosis of the conjunctivæ and the cornea will be deeply ulcerated with the formation of opacities. The inhalation of blister gas vapours causes damage primarily to the laryngeal and tracheobronchial mucosæ. The lesions develop slowly. The patient becomes hoarse and may become completely aphonic. A cough, particularly pronounced at night, is observed and in later stages becomes productive. Fever, dyspnœa and moist

râles are present and the incidence of broncho-pneumonia is high. Moderate exposures produce hyperæmia of the respiratory mucous membrane with necrosis of the lung epithelium. In more severe cases there is pulmonary congestion, mild patchy œdema, moderate acute emphysema and focal atelectasis. Bacterial infection of the lungs complicates the situation and suppurative bronchitis and bronchopneumonia may follow.

Self-Help

The respirator provides complete protection for the eyes and respiratory tract and must be worn at all times when the presence of mustard vapour is suspected or reported. If the eyes become contaminated either with droplets of blister gas or their vapour immediate decontamination is essential. The eyes should be thoroughly irrigated immediately with copious quantities of water. Unless this is carried out within a few seconds of contamination the damage cannot be completely prevented although it may be somewhat mitigated. When available, 2% sodium bicarbonate which is a decontaminant followed by saturated boric acid solution or normal saline is indicated.

In the event of liquid contamination of the skin, the free liquid should be blotted off with absorbent cloth and the latter discarded in a safe place. The contaminated area should then be treated with a bleach cream or household equivalent and then sluiced off. Lacking any of these protective preparations, the skin would be washed with soap and water after first removing gross contamination with absorbent cloth.

First-Aid

Personnel in the first-aid stations are prepared to carry on with the subsequent treatment of mustard lesions. Mild conjunctivitis from blister gases may be treated by the instillation of tetracaine which will exert an analgesic action. Application of sterile petrolatum to the lid margins will prevent the eyes from adhering together. If the injuries are more severe so that œdema of the lids with photophobia and blepharospasm are present and the patient is in considerable pain, apply an eye dressing with systemic sedation with morphine and the instillation of atropine sulphate solution where indicated.

Erythema of the skin from mild contamination requires little care beyond the application of a soothing lotion. If blisters have developed, a sterile petrolatum gauze dressing should be applied, and in the case of vesicles which have burst, the lesions should be treated with the same sterile technique that is employed for thermal burns.

No treatment other than rest is required for the hoarseness and sore throat which follow mild respiratory tract injury. Cough may be relieved by codeine.

Hospital

Hospital care is directed to limiting the invalid period and preventing complications. In the event of corneal involvement, which may be detected by staining with fluorescein, the patient should be referred to an ophthalmologist. Should the skin lesions become infected, or entry into burns or wounds suspected, specific anti-bacterial therapy may be instituted. If clinical signs of severe respiratory tract injuries become manifest, treatment is best given in hospital where the prophylactic administration of penicillin or sulphadiazine is recommended. The accepted practices for the treatment of broncho-pneumonia will be performed there.

Summary

1. Civil Defence authorities envisage the use of a variety of chemical warfare agents, but consider that nerve gases and blister gases of the mustard type constitute the greatest threat in any generalized chemical attack.

2. The properties of the latter two groups of agents have been described and an outline presented of the symptoms which develop in humans who have been contaminated either by the liquid or vapour forms of these agents.

3. The treatment of affected individuals has been considered at the three levels of self-aid, first-aid, and in hospital.

4. In the case of nerve gas casualties, personal decontamination has been stressed. The administration of atropine at first-aid stations constitutes the most important phase of the supportive therapy of such casualties.

5. Personal decontamination has also received stress as the first step in counteracting the effects of mustard gas exposure. The subsequent treatment of the lesions of the skin, eyes and respiratory tract follows established lines of procedure for the management of necrotizing lesions of these sites.

DEFENCE MEDICAL RESEARCH

JOSEPH DOUPE, M.D.*

Most practitioners of medicine may not be aware that the Federal Government, as part of its plan to strengthen our military position, is vitally interested in medical research. The promotion of all types of research for military purposes is the function of the Defence Research Board, which was established after the last War. Experience had then shown, as any reader of Churchill will know, that the research potential of a country engaged in combat may well be the decisive factor. The establishment of the Board indicates that the Government, the three Services and those responsible for civil defence appreciated the situation and worked out a plan whereby the research resources of the country could be utilized most efficiently. The Defence Research Board operates on behalf of the Armed Forces, but is independent of them, in order that needless duplication may be avoided and to ensure that the views of the research experts may be presented at the highest levels.

In most fields the Board has an intra-mural program carried on in its own establishments and it also, by grants-in-aid, supports pertinent research conducted in Universities. The intra-mural part of the medical program is concerned either with projects of a secret nature or with projects which cannot readily be done outside its precincts. Secrecy in medical research might be thought unwarranted, but in the present circumstance it seems justifiable. For example, possible enemies should be kept in doubt as to the extent of our knowledge or ignorance of their special lethal agents. The other aspect of the intra-mural program is concerned with projects, such as the development of better rations and clothing, which are not likely to interest extra-mural grantees. Furthermore, such facilities as a human centrifuge and decompression chambers are not ordinarily available in Universities so that projects requiring highly specialized equipment will be another indication for the work to be undertaken by the Defence Research Board itself.

In medicine, the extra-mural research program of the Board assumes relatively more importance than in other fields, because defence medical

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research is not far removed from other forms of medical research. This program is intended to supplement those of the National Research Council, the Department of National Health and Welfare, the Department of Veterans Affairs and the other agencies supporting medical research, in order to ensure that medical problems of particular importance to defence are not overlooked. This year an amount approaching $300,000 is being spent for this purpose. Some of this is being used to develop, in selected Universities, facilities for research in special fields such as radiation. However, the bulk of the funds has been allotted to assist individuals in Universities across the country. These individuals had applied to the Board for grants to cover the expenditures for equipment and technical assistance required to do research which had an apparent bearing on defence requirements. Within this limitation the Board is interested in both basic and applied research.

It is clear that at the present time medical research of defence interest cannot be sharply distinguished from medical research for other purposes. In recognition of this and in preparation for the time when it may be necessary to concentrate more of the medical research resources of the country on projects which directly bear on defence, an inter-departmental Co-ordinating Committee has recently been set up. This Committee exists to advise the Defence Research Board on matters of policy and to keep the other governmental agencies which support medical research aware of the requirements for defence research. The Committee is composed of the senior medical officers of each of the three Forces and representatives of the National Research Council, the Department of Veterans' Affairs, the Defence Research Board, and the Department of National Health and Welfare. The last named participates in a twofold manner, as it both supports a large research program and is interested in the results of research because of its concern with civil defence. The Chairman of this committee is Dr. C. H. Best, with Dr. J. B. Collip acting as alternate. A part-time executive secretary has been appointed to assist the Chairman.

To perform the functions described it is obvious that the Committee requires advice from experts in the various fields of medical science. To this end the Committee has divided the realm of defence medical research into some sixteen fields, as shown in the accompanying list. Against each

is a name indicating the individual, selected because of his acquaintance with service and defence problems and his interest in research, who has agreed to undertake the responsibility of providing advice and generally guiding research in that field. It will be noted that the individuals concerned are termed Panel Chairmen. This indicates that the plan provides for each of them to collect together a small group of experts so that the Defence Research Board, the Forces and Civil Defence may be sure of getting the best possible advice on any problem. Under this scheme it is possible for the Forces, and Civil Defence to obtain information quickly by simply informing the Secretary, who then communicates directly with the Panel Chairman concerned. The Panel Chairmen naturally have a potent voice in deciding which extra-mural projects will be supported.

The Panel Chairmen, plus scientific representatives from each of the bodies represented on the Co-ordinating Committee, form the Defence Medical Research Advisory Committee. Prof. J. S. L. Browne of McGill has been appointed as a special member in order that his wide experience will be available. This committee meets once or twice a year to review reports from the grantees, and to assess the progress being made in the various fields. It then makes recommendations concerning the emphasis that should be placed on each particular field, hoping to keep a step ahead of the actual needs of the Forces.

From the foregoing it will be seen that an organization has been established which permits close contact between the Forces and Civil Defence and those experts who have undertaken to keep themselves informed of the latest advances. No committee structure interferes with this contact but there is provision for the consideration of the overall program by two committees. The first is the Co-ordinating Committee, which exists to see that a proper service is being provided and that efficient use is being made of the Country's research resources. The second is the Advisory Committee which is responsible for advising the first as to the type of research which should be supported and the funds required.

It will also be evident that in establishing this organization, thought was given to requirements of full-scale war effort. In such an event the basis for a co-operative program by the various branches of Government will have been prepared. Furthermore, a group of experts will be available who, because of their prior knowledge of defence problems and by their familiarity with other investigators, will be in a position to guide a greatly expanded defence research program.

List of the Major Fields of Defence Medical Research

Panel or Field	Panel Chairman
1. Antibiotics	Dr. R. F. Farquharson Toronto
2. Blood Substitutes and Blood Products	Dr. A. L. Chute Toronto
3. Blood Transfusion and Preservation	Dr. R. L. Denton Montreal
4. Coagulants and Anticoagulants	Dr. R. L. MacMillan Toronto
5. Frostbite and Immersion Foot	Dr. D. R. Webster Montreal
6. Management of Burns and Wounds	Dr. A. W. Farmer Toronto
7. Radiation: Protection, Treatment	Dr. J. A. Dauphinee Toronto
8. Auditory Problems	Dr. W. J. McNally Montreal
9. Visual Problems	Dr. J. C. McCulloch Toronto
10. Motion Sickness	Dr. R. L. Noble London
11. Infection and Immunity	Dr. M. H. Brown Toronto
12. Arctic Medical Research	Dr. L. P. Dugal Quebec
13. Aviation Medicine	Dr. J. K. W. Ferguson Toronto
12. Nutrition	Dr. J. A. McCreary Vancouver
15. Psychiatry	Dr. T. E. Dancey Montreal
16. Toxicology	Dr. A. S. V. Burgen Montreal
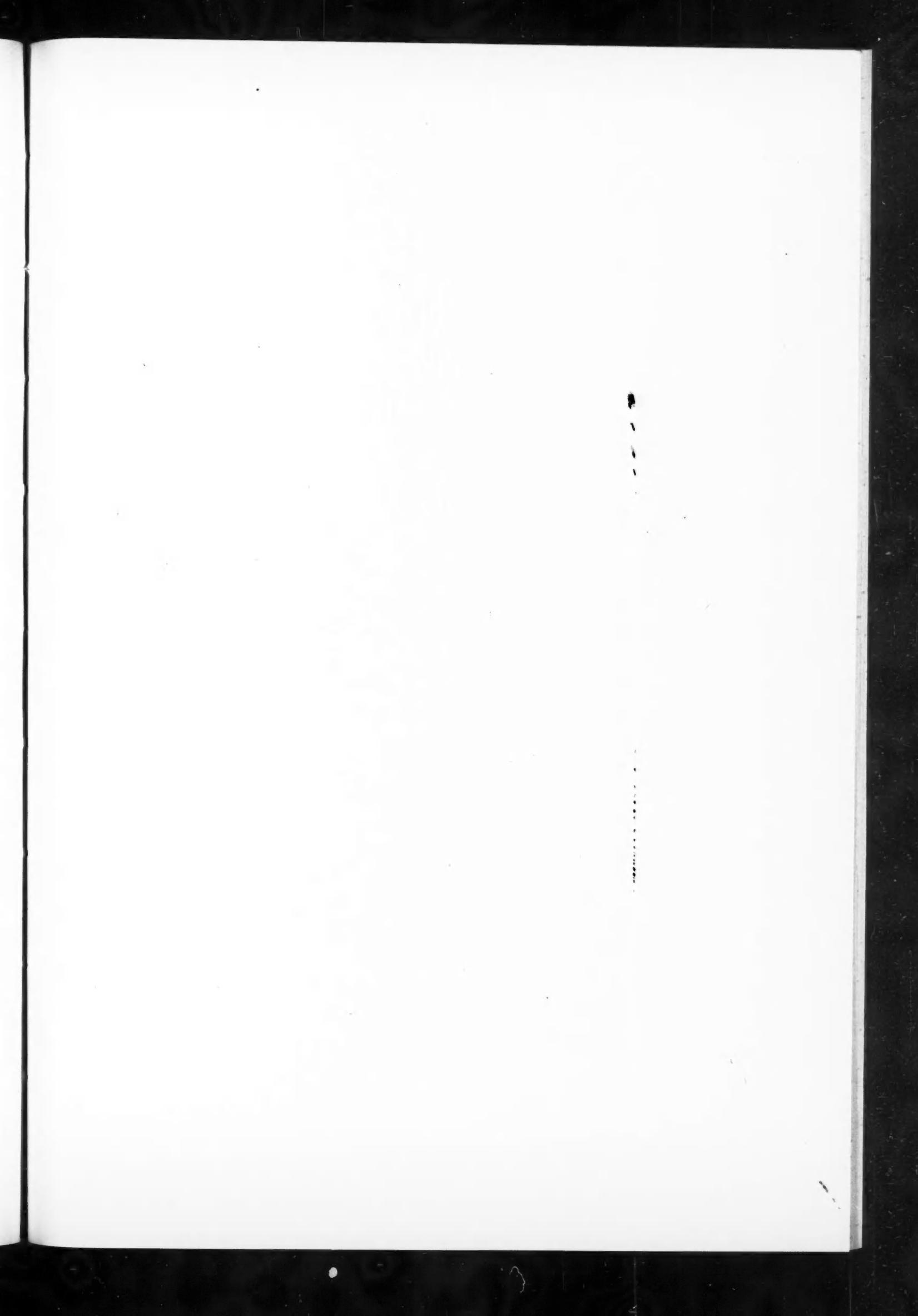
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APPLIED PSYCHIATRY IN GENERAL PRACTICE*

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TODAY, rather than presenting you with the usual synopsis of psychiatric conditions—a bird's eye view of psychiatry—I wish to do two things: (1) To show you that psychiatry and the medical application of psychological principles can be of tremendous value in your practice of medicine; and (2) to demonstrate that even in primarily psychiatric problems you can play the key rôle in many instances.

More and more we are beginning to recognize that applied medical psychology is a basic science of medicine, as important to the effective practice of clinical medicine as biochemistry, anatomy or general physiology. More and more medical educators are recognizing this, and psychiatric education in medical school consists of much more than a few lectures on dementia præcox, organic reaction types and commitment procedures for the "insane". Much remains to be done to integrate the more useful knowledge we have into the medical student's thinking. An equally important task for the psychiatrist is to put forth some of this material in a usable form for our fellow physicians in non-psychiatric fields who most likely have had only the most fleeting and unsatisfactory exposure to psychiatry in medical school.

Learning how to handle patients is one of the primary requisites of an adequate physician. Primarily a physician is not a salesman, but just like a salesman he must understand and be capable in his handling of people. This is often a rather upsetting idea, and often a threatening one, to the young scientist just going into practice. He is eager to have the world beat a path to his door, begging for the accurate, scientific application of the cool, healing hand. Often he has come to scorn the methods of the older practitioner with his bed-side manner. He vows his practice will include no mis-spent time with what he calls "crocks" and neurotic, healthy or otherwise. If he is in a specialty which is in great demand or in an area without competition, he may complacently and profitably go along high-handedly spreading pearls, but should he be competing against others who have a more mature and helpful understanding of people, he will soon either learn, starve or leave. Knowing how to handle people is not only an essential of good medicine, it is often an economic necessity.

To illustrate this a little further, let us take the example of the hostile patient. One of the most difficult problems we have as physicians is in handling these resentful, angry people. We all want to be liked and most of us need very much to feel we are helping others. A patient who shows anger at us undermines our self-esteem. We may react to this attack with counter attack, call him an ingrate or neurotic to ourselves, and quickly dismiss him with varying degrees of courtesy from our presence. And yet we may be left with the unpleasant feeling we have dismissed a sick person who needs our help, or we may have vague, guilty stirrings suggesting that perhaps it was our fault. We may even fear the harm that a malicious tongue can do to our reputation or practice. Learning to handle such people takes patience and time. It may also take many unpleasant episodes and much self-evaluation before we can handle anger in our patients when it is directed against ourselves. On the other hand, an attempt to find out why the patient is hostile, or to listen to his problems, may allow us not only to know the pleasure of eliminating his anger toward us, but of giving help to a person who obviously needs it. So often the angry person is that way because he is scared, scared of us or of his own illness. He needs help in overcoming his fears just as much as the patently fearful person who appeals to us directly for our help.

Today, as always, the physician needs to be more than just a therapist for disease, physical or mental. Much help can be given to a family by the family physician and really by nobody else. A very cogent example is the help the family doctor may give a couple who have a defective child. Often we find the parents so overwhelmed with guilty feelings about the child that they are unable to handle the problem wisely for their own, the child's or the best interests of other siblings. Many other examples can be given in which the doctor, armed with practical psychological skills, can do inestimable good for his patients in essentially non-medical fields.

Let us turn again to medical problems to illustrate the value of psychological knowledge in dealing with patients. A few examples will suffice. In patients with cardiac complaints, many will be found having symptoms on a functional, non-organic basis. Rangell[1] has estimated that the majority of patients with cardiac complaints will have no organic disease to be treated. When disease does exist, emotional problems may worsen the symptoms and the prognosis. This is particularly clear in cases of congestive failure, angina, or where a myocardial infarction has occurred. The need to recognize and to help alleviate the anxiety with such difficulties will often pay off in a smoother clinical course. Here the fallacy of "either/or" concept[1]—either organicity or neurosis—is most clear.

Often if the patient can "accept" his illness for what it is, the first successful step in treatment has been taken. The inability of a successful, driving business man to really accept the implications of a myocardial infarction can often lead to premature death or total disability. Many patients are too upset by the implications of our diagnosis to accept it. As physicians it is as important for us to be sure the patient can emotionally understand what we have told him, and accept it, as it is to give the correct pharmacological prescription.

In the fields of physical rehabilitation[2] and tuberculosis this problem is particularly acute. Here the utmost co-operation of the patient for long periods of time is necessary. And even after the acceptance of the disability has taken place, new problems arise. Any chronic illness leads, of necessity, to the patient's becoming very dependent on his doctor. With dependency often come demands, and anger when these demands are not met. Realizing this as a normal concomitant of long-standing illness, the physician will be able to understand, accept and deal with these feelings, instead of regarding the demanding patient as an "ungrateful nuisance".

In the realm of surgery a knowledge of emotional reactions can be valuable both prophylactically and in handling emotional problems when they arise postoperatively. Here again it is necessary for the patient to understand what is likely to be the outcome postoperatively. It behooves the surgeon to be sure the patient really accepts what is to happen, lest he or she awaken a few days postoperatively to the realization that an important part of the anatomy has been removed. Different organs have different importance to us, quite apart from their logical utility. Generally, the more "sexualized" an organ is, the more anxiety will be associated with tampering with it, e.g., the uterus, the breasts, the prostate, etc.[3] In children in particular, careful preparation of the child emotionally will pay-off in terms of fewer anxiety reactions postoperatively. Levi[4] as well as Straker[3] have pointed out the frequency of acute anxiety reactions in children under 3 or 4 who have had operations using general anæsthesia. These reactions, often quite prolonged, consist of generalized anxiety in many situations, nightmares, poor sleep, fear of the dark, and often various phobias. This has led to the recommendation that elective surgery be postponed until after this age. Jackson[5] has outlined the essential necessity of the anæsthesiologist winning a child's real trust before general anæsthesia is given. Using a carefully planned program of getting acquainted with the patient and securing the child's confidence, she reported: (1) elimination of the necessity of using heavy preoperative sedation and thus the elimination of the undesirable side-effects of such; (2) the need for less anæsthetic agent; (3) shortened induction period; (4) the excitement stage was decreased; (5) the operating room was quieter.

In the field of obstetrics there is, as Parks[6] has noted, a historical indoctrination that childbirth is an ordeal, painful and difficult. Its terminology with such words as labour pains, lacerations, forceps, rupture of the membrane, hæmorrhage and abortion are hardly likely to allay apprehension when used by the obste-

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trician in the presence of the expectant mother. When the physician can recognize such signs as excessive nausea and vomiting during pregnancy, interest in the morbid details of pregnancy, revulsion at the thought of breast feeding, and demands for complete narcosis as suggestive evidence of rejection of pregnancy, or at least as evidence of severe conflicts surrounding the whole thing, then much can be done to correct it before the child comes.

In no illness is it more important for the patient to have an understanding physician than when afflicted with cancer. It is clear that if we know what cancer means to the patient,[7] what special fears he has about the disease, we are in a much better position to handle him helpfully and to give him real emotional comfort in the remaining months or years of his life. As Shands *et al.*[7] have pointed out, many of us become disturbed by the patient's downhill course and avoid discussing his or her emotional problems. This the patient views as lack of interest or rejection, which increases the feeling of hopelessness. Diligently and helpfully attending the dying carcinoma patient is not an easy task for any of us, yet it is a duty that cannot be shirked even after we can do no more with medicine or surgery.

These are just a few examples of areas in which we can, as physicians, more effectively handle our patients' medical problems by applying common sense principles of medical psychology. These are examples drawn from the positive side. On the other hand, as is implicit in the Hippocratic oath, we wish to practise medicine so as to do as little harm as possible to our patients. We all know of physicians— luckily rare—who seem to enjoy deliberately scaring patients and hurting them psychologically, not to mention physically. Many of us may quite unwittingly harm our patients psychologically through ignorance or just plain carelessness in what is said within the patient's hearing. "Iatrogenic"[11] is the term applied to disorders caused by the physician. Unnecessary examinations, laboratory studies and operations on patients whose complaints are clearly neurotic in origin can fix the symptom and make its future treatment more difficult.

Another practical application of psychiatric knowledge in the general practice of medicine occurs in the diagnosis and treatment of physical disorders showing up initially or most clearly as psychiatric abnormalities. It cannot be emphasized too strongly that the nervous system may act as a "reflector of bodily disease",[8] of pathology elsewhere than in the nervous system. So often when we observe psychiatric symptomatology, we assume immediately that here is a problem for the psychiatrist and refer it as such. Often patients are referred who are suffering from metabolic, endocrinological or other toxic disorders, showing up clinically primarily with nervous system dysfunction.

Islet cell adenomas of the pancreas with symptoms of weakness and fatigue, anxiety, irritability, and in more severe cases with convulsions and delirium, may be mistaken for psychogenic disease. Hyperthyroidism often gives marked emotional instability with distractibility and euphoria, occasionally leading to a delirious reaction. Mild hypothyroidism may produce lethargy, chronic fatigue with slowing of mentation, which can be interpreted as premature ageing or as a depressive reaction. More clear-cut, severe hypothyroidism with myxœdema often leads to psychotic reactions. A case of this sort, diagnosed as paranoid schizophrenia, was recently referred to Colorado Psychopathic Hospital by a competent internist. Psychiatrically she did show some of the characteristics of schizophrenia. However, a careful mental status evaluation, along with careful history, physical and laboratory studies confirmed our initial impression of myxœdema. She has now continued to exist normally without psychological or physiological difficulties on 2 gr. of thyroid a day for over two years. Asher,[9] has reviewed this subject under the captivating title of "Myxœdematous Madness". Emotional disturbances in endocrinological disorders such as Addison's disease and in Cushing's disease are also to be noted. Psychic manifestations from ACTH and cortisone administration are a recent outgrowth of advances in hormone therapy, and should be included in any discussion of endocrinological and metabolic disorders.

Dr. Rundles,[10] in reviewing the neurological lesion associated with pernicious anæmia, has emphasized the frequency of the cerebral manifestations of memory loss and confusion that may be the presenting complaint in this disease. Congestive heart failure and small cerebrovascular accidents, silent strokes, as a cause of psychiatric symptoms are familiar to us all.

As a reflector of bodily dysfunction, the central nervous system reactions may give us indications of toxins from outside or exogenous sources. Toxic reactions to various drugs—bromides, opiates, alcohol, etc., are common. The central nervous system frequently reacts to these exogenous toxins, as well as to toxins from internal sources (bacterial, disordered hormone balance, etc.) with a delirium, an acute state of personality disorganization featured by disorientation, fearful illusions and hallucinations. Children and and adults over 60 are most prone to develop such reactions in response to toxins. Treatment of delirious reactions, which is often under the direction of the general practitioner, should include the following measures: (1) careful evaluation to determine the specific cause of the delirium so that this can be eliminated if possible; (2) protection of the patient against his own irrational acts. This should be done by close supervision rather than physical restraint, which often only adds to the patient's panic; (3) careful attention to the patient's nutritional state and fluid balance—blood transfusion may be necessary if the hæmoglobin is 50% or below; (4) sedation, which should be carefully chosen and administered so as not to increase the already existing toxicity; (5) adequate auxiliary care in a quiet, lighted room, with sufficient physical activity to maintain strength and circulation; (6) often some type of psychologically oriented investigation and help following the delirious episode to prevent its recurrence.

GENERAL PRINCIPLES IN HANDLING EMOTIONAL PROBLEMS

To turn now to some of the general principles which non-psychiatric practitioners can use in dealing with emotional problems in patients. This discussion can be divided into two areas: (1) the initial interviews, where we attempt to determine what we are dealing with; and (2) subsequent periods spent with the patient, designed to help him psychologically. Obviously these two areas cannot be separated entirely. A helping relationship starts with the first contact, and the results of a poor start may never be overcome. The aim of this discussion is not to tell you how to be psychiatrists doing psychotherapy, but to give you some useful information to help in your efforts to deal with emotional problems in your patients, problems which for various reasons cannot be referred elsewhere.

The initial interview or interviews should be approached with one basic principle in mind: Let the patient talk—listen to him, give him time and attention without interruption. As one patient recently told me, "seeing Dr. J., a busy internist much given to frequent phone consultations, was like the Telephone Hour, except that Lily Pons wasn't there". One needs a careful history, but usually that can be had without too frequent interruptions and questions on our part. So often the patient initially fears to tell us the problem for which he really comes. Our questions may only serve to cloud the situation further and make it more difficult for him. We must secure his trust in order to find out why he's in the office. In obtaining a history the raised eyebrow or a simple "what else?" may aid us in our search much more effectively than, "Now tell me, why did you really come in?", or "That's all very interesting, but what is the real trouble?" True, listening, allowing the patient to set his own pace takes time, but time saved at the expense of a correct diagnosis is not saved at all. When personal matters are brought up, the doctor can then productively inquire into them. The patient should be allowed to set the pace, and will seldom be offended by your further inquiries into areas he has already opened.

When and if it does appear that emotional difficulties are an important part of the current difficulty, it may be useful to reassure the patient you don't "think it's all in my head", "you don't think I'm crazy". Often, also some simple analogy about how emotions can cause somatic changes (such as blushing, or dyspepsia when nervous, etc.) may be reassuring. It is wise to note carefully somatic evidence of tension or anger, and comment on these reassuringly, since the patient will usually be unable to express this tension, or anger. This will do much to reassure the patient that you are capable of understanding him. The physical examination itself can also do much to reassure the patient of your interest, thoroughness and competence.

A good initial interview then, should give us a clear picture of the emotional aspects of the difficulty, and also some idea about the patient's ability to deal with this. In short, we will have a fair idea of whether we can help him with his emotional difficulties, should we wish to try.

Assuming following the initial contact, we have decided the emotional aspect of the difficulty is treatable, and that we are going to at-

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tempt to help the patient with it, we then move into the second area: sessions spent talking with the patient in an attempt to help him with the emotionally difficulty. Again, as in the initial interview, the ability to listen remains paramount. Continue to allow the patient to bring up subjects spontaneously, but reserve the freedom to ask further about any subject the patient does initiate. In case of obvious omissions—for example, no reference to a marital partner after several interviews—it is wise to inquire as to the reason for the omission. Don't be afraid of periods of silence, and generally allow the patient to break them. This emphasizes the responsibilities of the patient in the process and may give him time to get up his courage to talk about some of his difficulties disturbing him most deeply.

It is most worthwhile to be constantly on the lookout for evidences of the patient's feelings toward you. Seldom will the patient tell you he dislikes you, or doubts that the treatment can help. He will show you evidence of his feeling by devious routes—being late—calling you Mr. rather than doctor a few times, criticizing other physicians (but not you directly) and many other seemingly insignificant acts. He may continually ask for little favours—changes in the hour you have agreed on, phone calls for advice, requests for unnecessary medicine, etc. These are things we should be constantly on the watch for, and attempt to deal with directly by formulating what they mean to the patient. This may be met with denial, or it may be met with admission. In either event it is valuable for two reasons: it convinces the patient you are alert and capable of understanding him; and it gives him a background for understanding his neurotic means of reacting to people and situations. In time he will be able, with or without your help, to apply this insight to the broader field outside of treatment—his relations with other people.

As mentioned, the doctor who is helping the patient attempts to establish an uncritical, accepting atmosphere in which the patient gradually becomes able to see the connections for himself, without fear of criticism for being the way he is. This accepting atmosphere does not mean the physician is entirely passive. Quite the contrary—he must constantly be on the alert to pick up the patient's feelings and help the patient become aware of these. This not only strengthens the doctor's helping relationship with the patient,

but even more important, it allows the patient to examine further his disturbed emotions.

Interpretations have their place, but in the type of brief help outlined here, they are to be used only sparingly. Interpretations of feelings, coming when you believe the patient understands, can be most valuable. Thus, a remark like: "Your boss's criticism seemed to sting even more because you also have worried about the same deficiencies he has accused you of", may be very helpful. On the other hand, interpretations like: "You hate your father because you are jealous of the way he took your mother's affection away from you" are usually valueless to the patient, no matter how basically correct. It is wise then to stay away from interpretations, unless you feel reasonably sure of their accuracy, and you believe they will have real meaning to the patient in terms of what you have talked about together.

In the process of helping the patient two special problems must be considered: advice, and information. Advising the person about specific ways of solving life problems is seldom useful to him. Simply, if he were capable of accepting the advice, he probably would already have solved the problem in the logical way previously. If you give it, he may actually accept your advice and carry it out in a way to prove you wrong, saying: "I did it the way you told me, and look, what are you going to do now?" Obviously the patient is more dependent on you, and has not acquired any new skills in handling his problem maturely. On the other hand, information may be quite valuable. For example, factual information to an adolescent about masturbation may reduce many of his guilty feelings and allow improvement in general functioning by the attendant relief of anxiety. One should always search for the reasons behind the request for information. If these reasons appear irrational or neurotic, they should be explored with the patient.

After improvement has been obtained, the problem of how to terminate the helping relationship must be faced. We frequently underestimate how much the relationship has meant to the patient, and forget that terminating it may be a great blow to him. Thus, when our goal of relief of symptoms for which treatment was started seems to be reached, it is well to bring up termination, preferably when the patient himself has shown he is also thinking about

it. Usually he will bring this up indirectly by mentioning how much better he is, or by seeming to have little in the way of problems to talk about. It is well, then, to make some simple remark like: "You're wondering how much longer we will need to continue". He may agree, and then between you a few final interviews can be arranged. If he denies the suggestion, and you now believe he is ready for termination, it will be necessary to talk with him about his fears of not seeing you any more—essentially his fears of loss of your support. In any event several terminating interviews should be set in order to give a chance to work with his fears about "going it" on his own. Never forget that the relationship has meant much to the patient and that terminating it will have some element of abandonment to him. This feeling of rejection should be watched for and talked about as a normal reaction to terminating any close relationship.

There are many technical problems involved which we cannot go into. Frequency and length of interviews, however, should be mentioned. I would suggest one-hour periods weekly. However, one-half or three-quarter hour periods may be more feasible and can be quite helpful. Longer intervals than one week between visits can reasonably be used. The whole process can be quite flexible, keeping in mind the major principles outlined. For example, some cases can never be entirely terminated. The patient receives continual help by knowing you are there and that he can see and talk with you even if only once a year or so. Even if one does not attempt treatment as I have outlined it, many of the principles can be most helpful in the effective handling of the neurotic medical patient.

Having an awareness of emotional factors in illness is a major step toward being able to handle these difficulties in our patients. Some physicians are natural psychotherapists; others must learn by repeated experience. Most physicians can learn more effective ways of handling such problems. As Barhash[12] has remarked: "When common sense, sensitivity, honesty and intuition are bolstered by . . . psychological knowledge, then we can speak of the results as psychiatric technique. These are equally available to the non-psychiatric medical practitioner".

This brings us finally to the problem of handling psychological problems one may not be

equipped to treat or alleviate. This is a particularly acute problem when dealing with psychotic persons. Recognizing a seriously ill psychotic as such may present difficulties. Often, again, listening to the patient's complaints may clear up the matter readily. It is not difficult to recognize the *bizzarrerie* of psychotic thinking if we are on the look-out for it. Worthwhile remembering is that schizophrenics, early in their illness, may have numerous somatic complaints, the eccentricity of which is not apparent unless we listen carefully. Unnecessary surgery for these complaints—hardly an acceptable form of psychosurgery—can thus be avoided. Depressive reactions should be watched for continuously, because: (1) they may be hidden under numerous bogus somatic complaints; (2) there is a constant danger of suicide; (3) psychiatric therapy—including electroshock therapy—can usually adequately and rapidly improve or cure the symptomatology. These patients should definitely be referred if at all possible.

Referring neurotic patients when you have studied and are firmly convinced they have non-organic complaints, or at least complaints needing intensive psychiatric care, requires both tact and time. Yet on you, as the referring physician, depends much of the success of the future psychiatric treatment. A good referral makes our problem as psychotherapists, much easier. A poor referral may leave us with a hostile, resentful, resistive, essentially untreatable patient. The basis of a good referral is laid down during the initial interviews. The atmosphere should be permissive and the patient encouraged to talk about his problems, physical and emotional. This can be facilitated by supportive remarks by the physician. After an adequate history and physical laboratory tests should be done, if indicated. Always, however, the patient should understand you have an open mind about his condition and are not trying to prove gallbladder disease, cardiac disease or the like. It is wise never to give in to the patient's demands for tests you believe unnecessary. This will often lead to an impasse which will make correct referral impossible, and often lead the patient into fruitless medical shopping.

Thus a good referral can only be made when you have the patient's confidence and when an effective doctor-patient relationship exists. When you bring up the question of referral to the patient it is well to give him an opportunity to ex-

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press his feelings about seeing a psychiatrist, his fears and his concern that he will be thought of as a neurotic by family and friends. Often at this time the patient may feel you dislike him, are abandoning him because you can find nothing wrong with him. These feelings should be looked for and dealt with. If the patient does not accept referral at this time, the groundwork has been laid for psychiatric help in the future. It is never advisable to attempt to force a neurotic patient into psychiatric care, no matter how necessary this type of treatment may seem. In a resistive patient it is better to lay the basis for future care in a friendly, understanding way rather than attempting to force him to do something he is not ready to do at that time.

Flummerfelt[11] aptly summarized the importance of the referral process in psychiatry: "The fact is that psychotherapy has already started when a patient comes to his physician for help, and when the physician has decided that a psychiatric referral is indicated and so advises him".

SUMMARY

Medical applications of psychiatry in general practice have been considered in the following areas:

1. Handling hostile patients.

2. Helping families with essentially non-medical problems.

3. Recognition of emotional disorders disguised as physical disease.

4. Recognizing emotional factors in physical disease.

5. Recognizing physical disorders showing up initially with psychiatric symptomatology.

6. Methods and techniques of handling emotional problems, including an outline for brief psychotherapy.

7. Handling patients needing specialized psychiatric treatment with emphasis on the referral process.

By discussion of these areas I have attempted to demonstrate that psychiatry is a basic necessary medical science, and one which can be straight-forward and reasonable in its clinical applications.

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ISONICOTINIC ACID HYDRAZIDE IN PULMONARY TUBERCULOSIS*

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IN THE GENERAL ADVANCE of chemotherapy German investigators have been studying the thiosemicarbazones with particular reference to antitubercular activity.

While studying the sulfones (Promin etc.) Behnisch, Mietzch, and Schmidt[1] working in the laboratories of the Farbenfabriken Bayer Company, developed certain thiosemicarbazones, of which the main one to reach clinical trial was designated Tb 1/698. Observations showed that recently developed exudative pulmonary lesions receded rapidly with this drug. Emergence of

drug-resistant organisms, anæmias and agranulocytic reactions, and some degree of toxic damage to the liver precluded large scale clinical trial elsewhere.

However, Schnitzer and Grunberg[2] of the Roche Chemotherapy Laboratories noted that isonicotinic acid hydrazine (IAH) used as an intermediate in the preparation of the thiosemicarbazone of isonicotinicaldehyde, had a profound effect on experimental tuberculosis in mice. Clinical trials were started in June, 1951 by Selikoff and Robitzek[3, 4] of the Sea View Hospital, Staten Island, New York.

The patients studied by the Sea View Hospital group had progressive bilateral, caseous-pneumonic tuberculosis. All had positive sputa, most had an elevated temperature and many showed evidence of toxicity. In their series all cases became afebrile and toxicity disappeared. There was a marked reduction in cough, volume of sputum expectorated, and in the number of

tubercle bacilli raised. One-quarter of the patients became negative on direct smear. The gains in appetite, weight, and strength were remarkable. Some clearing of exudates and other favourable changes were demonstrated roentgenologically in less than a quarter of the cases.

A review is presented of 20 cases observed for a 10-week period who were treated with a daily, oral, divided dosage of 250 milligrammes of isonicotinic acid hydrazide (Rimifon-Hoffmann LaRoche).

SELECTION OF CASES

Owing to the limited available supply of drug, patients chosen were those in whom a therapeutic impasse had been reached. All cases had received not less than two courses of combined streptomycin and para-amino salicylic acid (PAS) therapy; each course consisting of streptomycin 1 gm. daily for 42 days given intramuscularly and an average daily dose of 12 gm. of PAS given orally. Thirteen cases had previously undergone major thoracic surgery. Four were desperately ill patients in whom the prognosis was apparently hopeless, including two with broncho-pleural-cutaneous fistulæ. The remainder (with one exception) had persistent cavities, positive sputa, or other signs of progressive tuberculosis. The exception was a nursing sister with a minimal apical lesion and a fever. Summaries of three cases are presented singly below.

CASE 4

J.S. This white male age 27 completed a two-stage left five-rib thoracoplasty on 27/1/50. Patient refused to remain in hospital after completion of surgery. He returned a year later with a positive sputum, a cavity in left upper lobe and extensive exudative productive disease in remainder of left lung. Temperature was elevated to 101° daily. He was desperately ill and required weeks of intravenous feedings in addition to several blood transfusions. IAH in a dose of 250 mgm. daily was started on 22/4/52.

Within ten days he was afebrile and the toxic condition abated. Appetite and feeling of well-being improved remarkably. In a month sputum was reduced in volume from four ounces to a quarter of an ounce daily and acid fast bacilli were reported as numerous rather than many. In another month sputum was negative but x-ray films showed that the cavity had enlarged. General condition was good and he gained twenty pounds. He was considered fit for thoracic surgery when a moderate hæmorrhage occurred, the first he had experienced.

Laboratory data at time of hæmoptysis; coagulation time, 15 minutes; plasma prothrombin activity 62%; NPN 26, total protein, 7.46 gm.; albumin 3.19; globulin, 4.27. IAH was discontinued and a few days later hæmorrhage stopped. Within two weeks coagulation time was 6 minutes, prothrombin activity 84%. Three weeks after discontinuance of IAH acid fast bacilli were again present in sputum. Surgery is to be carried out presently in this case.

Comment. – Patient was a thoracic surgical failure due largely to his own irresponsible actions. Sputum showed many acid fast bacilli which were resistant to streptomycin. Response to IAH was striking and typical of that obtained in the more toxic febrile, severely ill patient with tuberculosis. The complication of hæmoptypsis is discussed further later on.

CASE 8

L.W.E., white male, aged 32 with moderately advanced disease, apparently arrested, had a left thoracoplasty in August, 1948. He was admitted on 16/4/52 very acutely ill with a week's history of fever and malaise, and having clinical and radiological signs of a massive right sided lobar pneumonia. His sputum showed many acid fast bacilli on direct smear and later culture. He was put on streptomycin gm. 1 daily and terramycin 1,000 mgm. *stat* and 250 mgm. q 4 hours. The acute condition responded well. Planigrams 30/4/52 confirmed the presence of a large cavity in right upper lobe. He was put on 250 mgm. IAH daily, the streptomycin being continued. On 10/6/52 it was decided in view of the obvious improvement, weight gain of 10 lb. and conversion of sputum, combined with his restless temperament under hospital restriction, to proceed with a right apicolysis with extrapleural pack to close the cavity. This was carried out on 20/6/52. His present condition is apparently excellent and he has continued to gain weight. The cavity has been closed by the extrapleural pack and shadows have shown further clearance radiologically.

Comment.—The effect of an acute lung infection, (in this case lobar pneumonia), on apparently arrested disease is demonstrated. Latent tuberculosis was activated, sputum became positive, and a cavity quickly appeared. Chemotherapy and surgery produced a more rapid result than usual, and the immediate prognosis seems good.

CASE 11

H.W.E., a staff nurse age 26 was found on routine x-ray to have a minimal, apparently active, left apical lesion. She had no sputum and repeated gastric washings were negative on direct smear and culture throughout total period of observation and treatment. Mantoux positive. A course of combined streptomycin and PAS was given with bed rest. She was discharged to continue her treatment at home after being under hospital care for 208 days. During this time her temperature daily range tended to be 98 to 99.4° and pulse rate 80 to 90, apparently uninfluenced by bed rest and chemotherapy. There had been steady radiological improvement and at time of her discharge lesion appeared to be fairly well fibrosed.

She was readmitted one month later with an unchanged lesion in left apex. On account of the persistent elevated temperature IAH 250 mgm. daily was started. After ten weeks temperature elevation remained unaltered. No change was noted in appetite, sense of well being, etc. and weight was stable at 114 pounds. No other cause was found for the temperature and she was discharged under supervision.

Comment.—The problem of low-grade pyrexia in a nurse with a recently fibrosed pulmonary lesion is a source of worry to the clinician. The

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therapeutic effect of IAH, both subjective and objective, was nil. It was concluded that the temperature elevation was non-tuberculous and probably normal for this person.

RESULTS

Sputum.—Sixteen of the patients had sputum consistently positive for acid fast bacilli on direct smear and culture prior to treatment. Significant reduction in the number of organisms per specimen was noted at the end of four weeks. At the end of ten weeks' therapy 12 of the 16 positive cases had become negative on direct smear; the remaining 4 had fewer organisms per specimen but were still positive. Examinations were made on a weekly basis and showed that conversion, where it occurred, was a gradual one. Reduction in cough and volume of sputum expectorated was marked in most cases. Cultures read at monthly intervals have, with one exception, remained positive (see Case 8 L.W.E.).

TABLE I.

BACTERIOLOGICAL EXAMINATION OF SPUTUM
FOR MYCOBACTERIUM TUBERCULOSIS (SMEAR)

Smear	Pre therapy	Present status
Many	5	Nil
Numerous	6	1
Few	5	3
Negative	4	16
Totals	20	20

Roentgen changes. — Cavitation was present prior to commencement of therapy in 11 patients. One patient who had been considered for lobectomy had cavity closure in 8 weeks. There was lessening in size of cavity in 3 of the cases; in one case cavity had increased in size and the remainder demonstrated no change. Improvement in other potentially reversible lesions was noted in 7 cases, but one had a definite spread of exudative disease, and the appearances in remaining cases were substantially unchanged.

Blood examinations.—There have been reports[5] of lowering of hæmoglobin level and eosinophilia occurring during treatment. In our experience presented in Table II there has been a definite tendency towards increase of hæmoglobin level. There was a drop in total white cell count most marked where the initial figure had been highest.

A tendency towards eosinophilia was not noted; changes in sedimentation rate (Wintrobe) showed no definite trend.

TABLE II.

BLOOD STUDIES

Patient		Sed. rate	Hg.-gm. %	W.B.C.	Eosins.
1	a	25	12.8	9,600	3
	b	31	14.17	9,000	2
2	a	31	9.6	15,200	1
	b	24	10.44	21,500	10
3	a	19	13.5	8,050	2
	b	15	13.83	8,350	3
4	a	19	12.2	16,100	1
	b	33	13.68	13,500	2
5	a	22	14.1	8,900	4
	b	29	13.52	8,700	3
6	a	24	14.00	10,500	4
	b	18	12.90	7,400	2
7	a	37	12.3	10,300	5
	b	36	14.17	13,000	3
8	a	36	11.4	21,800	—
	b	32	12.56	9,400	1
9	a	12	12.90	8,100	1
	b	8	15.45	6,000	2
10	a	21	13.6	8,900	2
	b	13	13.4	7,900	2
11	a	3	12.5	6,450	—
	b	4	12.4	6,600	—
12	a	33	13.05	18,400	2
	b	19	14.8	10,700	3
13	a	9	13.0	11,450	—
	b	7	13.83	10,100	4
14	a	22	12.7	11,000	—
	b	9	12.22	10,600	4
15	a	29	13.68	8,200	1
	b	10	13.52	8,000	—
16	a	31	12.8	12,350	2
	b	24	13.2	9,700	—
17	a	25	15.1	6,500	2
	b	17	17.06	6,400	4
18	a	17	10.6	7,700	5
	b	27	11.91	10,800	5
19	a	34	12.2	13,400	3
	b	15	14.17	9,500	2
20	a	1	11.85	7,900	—
	b	12	12.8	7,000	—

Note:—(a) refers to pre-therapy condition; (b) to present status.

Systemic effects.—In parallel with the reported experience of patients in the Sea View Hospital, most expressed improvement in their sense of well-being. Where pyrexia and toxicity were case features it was found that temperatures returned to normal in a few days and toxic symptoms disappeared. Within a short period anorexia and lassitude ceased to present a treatment problem. Weight changes are tabulated below.

TABLE III.

WEIGHTS

Substantially unchanged	5
Gain of from 1 to 5 lbs.	6
Gain of from 5 to 10 lbs.	4
More than 10 lbs.	5
Total	20

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TOXIC OR OTHER ADVERSE REACTIONS

In the literature to date toxic reactions, skin rashes, and allergic conditions have not been recorded. Such symptoms as vertigo, constipation, and urinary bladder retention seem unimportant. Hyper-reflexia, euphoria and the effects of central nervous stimulation have been observed, but no cases of toxic encephalopathy.

No untoward side effects of the type related were observed in our series; but a moderate pulmonary hæmorrhage developed in Case 4. Patient had not had a previous hæmoptysis. The clotting time was prolonged and the plasma prothrombin activity reduced. IAH was discontinued and the hæmorrhage ceased in a few days. Within two weeks the coagulation time and prothrombin activity were normal. In two cases not included in this series (both with a previous history of hæmoptysis), hæmorrhage occurred and IAH was discontinued. Pulmonary hæmorrhage has been mentioned as a possible complication of this drug.[6]

Investigation of plasma prothrombin activity serum prothrombin consumption, whole blood coagulation time, plasma coagulation time, and platelet studies were done on these patients. Results to date do not indicate any significant alteration. Capillary fragility and bleeding time are now being tested.

Liver function tests[7] have been found to yield decreased values indicative of toxic derangement in acutely ill tuberculous patients. In Case 4 it is possible that the alterations in plasma prothrombin time, etc., were related to the severity of his tuberculosis and its effect on the liver. In other words, the depressed liver function, etc., were probably related to toxicity due to tuberculosis and not to the drug.

An alternate explanation of the hæmoptyses observed is that bacilli whose virulence has been greatly weakened—or killed bacilli—may during the disintegration of their body substance still give rise to toxic destruction in the presence of hypersensitization. This might also account for the slow closure, and in some cases enlargement of cavities in cases under treatment, and is a reminder that therapy should probably be long continued.

PRESENT STATUS OF CASES

One patient has had a lobectomy and has been continued on the drug postoperatively. Convalescence has been marked by a continuation of the good appetite previously experienced. Case 4 (see above) and Case 13 are awaiting surgery. Case 19 with a tuberculous empyema and a broncho-pleural-cutaneous fistula has had closure of the fistula and the empyema has cleared up. IAH by mouth was the only treatment used in this case. A second case, No. 15, has shown sputum conversion and bronchopleural-cutaneous fistula is smaller and apparently closing. His general condition is very good. Case 8, as reported, required an apicolysis and extrapleural pack. Two patients have been discharged under supervision. The drug is being continued in the remainder.

DISCUSSION

A new drug is with us in the treatment of tuberculosis. It is a synthetic chemical of known composition, relatively non-toxic, cheap and simple to prepare. It is in direct line of descent from Ehrlich's work. Until now streptomycin has been the main chemotherapeutic agent used in tuberculosis. Combined with PAS, a weaker tuberculocidal compound, emergence of drug resistant tubercle germs is delayed and a synergistic effect obtained. A painstaking survey by the British Medical Research Council[8] amply demonstrates the value of this combination. It will be some time before IAH can be similarly surveyed. The early evidence suggests that streptomycin and PAS have a more favourable effect on the sedimentation rate and roentgen changes. IAH has a more rapid action on fever and toxicity, and in respect to appetite and sense of well-being it is particularly effective.

The ancestry of IAH suggests that the emergence of drug resistant organisms will be a problem, and early reports indicate this may occur.[4, 5, 9] IAH will act on acid fast bacilli resistant to streptomycin both *in vitro* and *in vivo*.[10]

Chemotherapeutic agents with different modes of action in the body may show a synergistic effect[11] when used in combination. In view of the difference in clinical reaction of IAH and streptomycin, and the difference in the mode of action a synergistic effect might be obtained, and it might be hoped a blended clinical picture. Preliminary reports of this and other combinations should not be long in appearing.

Streptomycin and IAH have been used together in two cases not included in this series. Therapy was combined in one patient under-

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going lobectomy and no ill results were noted. The second case was completing a course of streptomycin and PAS and due to spreading exudate, IAH was started and PAS discontinued. No untoward changes resulted.

Due to the possibility of adverse reactions particularly hæmoptysis, and other toxic effects observed with higher doses, it would appear to be a drug to be used only in hospital where facilities are available to detect and treat these promptly.

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PHYSIOPATHOLOGICAL CLASSIFICATION OF THE HÆMORRHAGIC DISEASES[*]

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A RATIONAL CLASSIFICATION of the hæmorrhagic diseases presupposes an evaluation of the physiological problem. For practical and for theoretical purposes, a first general subdivision of the hæmorrhagic diseases concerns the distinction between forms with alterations of the blood coagulation and forms which are chiefly associated with vascular defects. As the last fifteen years represents the so-called renaissance period of blood coagulation, the modern physiological knowledge on this field made it possible to study especially the diseases of the blood coagulation. In fact the vascular factors have not yet been so well investigated as the clotting factors, and maybe some vascular forms will belong in the future not with the hæmorrhagic diseases, but with other groups of diseases.

I shall discuss in detail the forms associated with alterations of the blood coagulation, because they represent a field of pertinent interest. Regarding the other forms a tentative interpretation has been given in our monograph on hæmorrhagic diseases.[1]

Some preliminary statements about the clotting mechanism are necessary, in order to understand the following considerations. From a general point of view the old scheme of Morawitz still retains its value. The distinction between the

two fundamental phases thrombin formation and fibrin formation, still represents the basis of the actual schemes. In these schemes there are, however, many new factors. Furthermore we have more information than before about the two following phases of blood coagulation: clot retraction and fibrinolysis.

I. Prothrombin
        Thromboplastin   { plasma factor / platelet factor
        Converting factors
        Accelerating factors
        Calcium
Thrombin
        thrombin
II. Fibrinogen ⟶ fibrin
III. Clot retraction
IV. Fibrinolysis
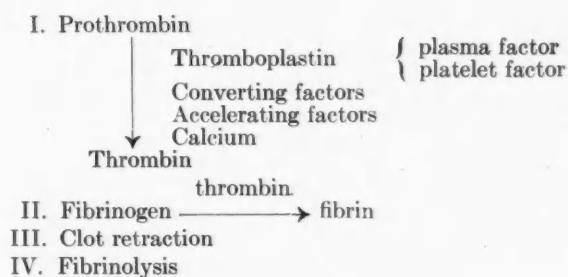
The data arising from the researches carried out in the last years chiefly refer to the so-called *converting* and *accelerating factors*. The identification of such factors is not yet conclusive. At the last Macy Conference on Blood Clotting and Allied Problems,[2] a subcommittee was appointed in order to establish the equivalence of all these factors, at least from a physiopathological point of view. In the next schemes two series of such factors are collected, and some more terms have been included.

Accelerating factors	*Converting factors*
Plasma and serum Ac-globulin[3,4]	Co-factor V[5]
Factor V and VI[5]	Proconvertin and convertin[6]
Proaccelerin and accelerin[6]	SPCA (and precursor)[11]
Globulin of Fantl Nance[7]	Co-thromboplastin[12]
Labile factor[8]	Factor VII[13]
Plasmatic co-factor of thromboplastin[9]	Dicoumarol factor[14]
Convertibility factor (Iowa group)[10]	Stable conversion factor[15]
	?Prothrombinogen[16]
	?Prothrombin converting factor[17]
	?Proserozyme[18]

In the next scheme the group of factors involved in the formation of thromboplastin is presented. It seems likely that thromboplastin is formed by the interaction of a plasma factor and a platelet factor.[19]

THROMBOPLASTIN

Plasma factor	Platelet factor
Antihæmophilic globulin	Platelet enzyme
Thromboplastinogen[20]	Thromboplastinogenase[20]
Plasmatic thrombokinase	Platelet thrombokinase

If we consider that prothrombin may be slowly transformed into thrombin by the simple addition of sodium citrate,[21] it is probable that the converting and accelerating factors further accelerate a reaction which may proceed spontaneously, without any other factor, not even calcium and thromboplastin. The intervention of accelerating and converting factors has importance especially from the clinical point of view, because for effective hæmostasis a prompt transformation of prothrombin into thrombin is necessary.

In order to have an idea of the *quantitative interrelationships* between the various factors, the following observations have to be borne in mind: (1) an equilibrium is necessary between the various factors in order to have a normal reaction; (2) the alteration of one factor involves secondary alterations of other factors; (3) within certain limits the relative deficiency of a factor may be compensated for by the excess of another factor (see interrelationships between Ac-globulin and thromboplastin,[22] and between calcium and thromboplastin[23]). Furthermore the expression of utilization or consumption of factors, which became very popular during the last years, only presupposes the possibility of detecting or not a factor by means of determined techniques. This does not necessarily imply utilization or consumption but rather perhaps the destruction of a factor by another factor which is formed (see activation and successive destruction of Ac-globulin by the formed thrombin[24]).

It is very probable that the formation of thromboplastin is indispensable for the reaction between the other factors, and for this reason the reaction between the platelet and the plasma factors of thromboplastin should precede the other reaction. If we have a deficiency of the platelet factor of thromboplastin, a secondary deficiency of thromboplastin is obtained. Even if the level of the plasmatic factor is normal, only a portion of it participates in the reaction.[25]

Probably the same happens also in the presence of deficiencies of a plasmatic factor. Consequently an insufficient amount of prothrombin is formed, and even in the presence of a normal amount of prothrombin, converting and accelerating factors, only a part of such factors partici-
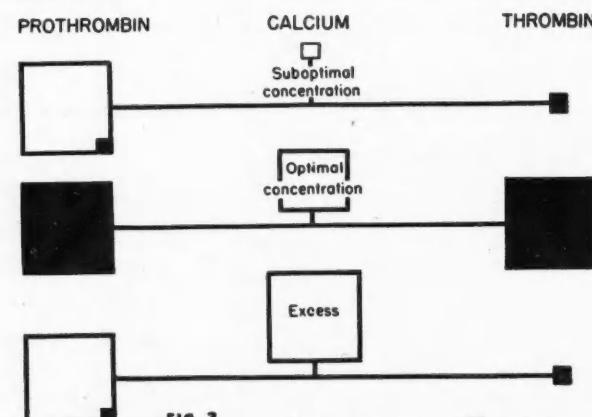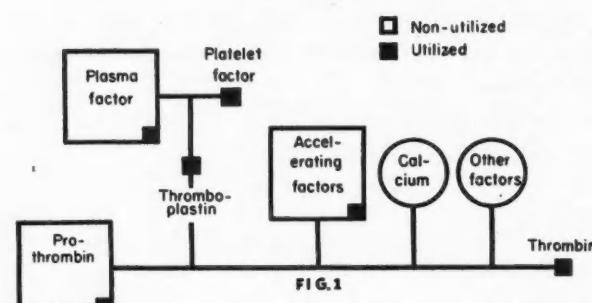

Fig. 1.—Illustrating the physiopathological consequences of a deficiency of the platelet factor of thromboplastin: secondary deficiency of thromboplastin and of thrombin, incomplete utilization of the plasma factor of thromboplastin, of prothrombin and of accelerating factors.
Fig. 2.—Prothrombin utilization and thrombin yield are decreased in presence of non-optimal concentrations of calcium.

pates in the reaction, and actually we have a decreased utilization of prothrombin,[26 to 28] of accelerating factors[29] and probably also of converting factors[30] (Fig. 1). Similar observations may be made for the following stages of prothrombin activation, as for instance for the interrelationships between prothrombin and calcium. If we take into consideration non-optimal concentrations of calcium, we observe a decreased utilization of prothrombin and decreased formation of thrombin. Such behaviour leads to the hypothesis of a stoichiometric mechanism of blood coagulation.[31] But even though very definite proportions have to be considered in such a connection, it is probable that the presented experiments only suggest the possibility of a shift of equilibria in the reaction[32] (Fig. 2).

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In a modern classification of the hæmorrhagic diseases, first to be considered should be the forms in which the mechanism of formation of thromboplastin is altered. *Hæmophilia* and *thrombocytopenia* should be therefore studied at this point. In fact the behaviour of these two diseases seems to be complementary:[33, 34] by mixing hæmophilic blood with thrombocytopenic blood, a normalization of the prothrombin utilization is observed.

The new knowledge on blood coagulation allows us to reinterpret some puzzling results in connection with these two diseases. In the classical descriptions it was admitted that hæmophilia is characterized by prolonged clotting time, and thrombocytopenia by a normal clotting time. Today the concept of the normal clotting time in the thrombocytopenias has to be reviewed: if we remove all platelets *in vitro* by means of special techniques such as silicone and low temperature,[35] we may observe a very prolonged clotting time, and even the coagulation in successive stages, as happens in hæmophilia. The same can be observed *in vivo* only in a few cases,

Prolonged Clotting Time in Glass and Coagulation in Successive Stages

Usual finding in	*Occasional finding in*
Hæmophilia	Hypoprothrombinæmias
"Hemmkörperhemophilia" (circulating anticoagulants)[37]	Deficiencies of converting and accelerating factors
Hyperheparinæmias	Thrombocytopenias

probably because a small amount of platelets is sufficient to give a certain amount of platelet factor, and consequently to make possible the formation of a small amount of thrombin and of a solid clot in normal time.[36] In such cases of apparently normal clotting time the defect can be detected by the test of prothrombin utilization. On the other hand we may observe a normal clotting time also in true hæmophilia of light degree[34] and in hæmophilia after transfusion (normalization of the clotting time but not normalization of the prothrombin utilization).[38] These data raise the question as to whether the so-called antihæmophilic globulin

Normal clotting time in glass	*Detection of the defect by means of*
Hæmophilia after transfusion and of light degree[34,36] Thrombocytopenias	Prothrombin activity in serum
	(*)
Hypoprothrombinæmias	Prothrombin concentration Clotting time in silicone tubes [40,41,42]

*Heparin tolerance test *in vitro*[39]

acts as a catalyst or as an accelerator, as it could be suspected on the basis of previous experiments.[43] In the clinical field, for instance before operation, the apparently normal clotting time of transfused hæmophiliacs has to be taken into consideration. The persistence of a poor prothrombin utilization after transfusion, in spite of a normal clotting time, represents a definite predisposition to hæmorrhage, as happens in thrombocytopenias (Fig. 3).

Prothrombin utilization and clotting time after transfusion in hemophilia
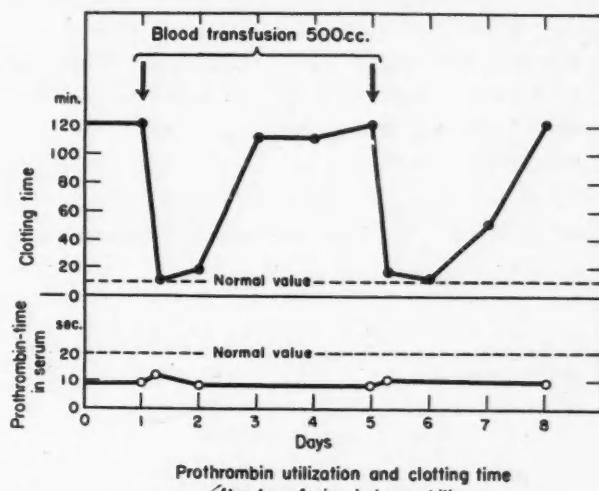
Fig. 3.—The normalization of the clotting time in hæmophilia after transfusions does not necessarily involve the normalization of prothrombin utilization.(38)

Some remarks are necessary about the position of hæmophilia and thrombocytopenia at this point in the classification of the hæmorrhagic diseases. In fact some data do not support the existence of a deficiency of antihæmophilic globulin in hæmophilia and some authors suppose that coagulation defect in hæmophilia should be correlated to the presence of an inhibitor. By treating the hæmophilic plasma with asbestos or by diluting it, an almost complete normalization of the clotting time is obtained, and we have been able to confirm such a phenomenon. The mentioned procedures should be able to remove the inhibitor from the plasma.[44] But even beside these procedures, another simple experiment could reopen the discussion about a question which already seemed to be settled. Today it is admitted that the differentiation between hæmophilia and circulating anticoagulants could be done by means of the so-called screening tests. Such tests are carried out by mixing in various proportions normal plasma with the plasma to be tested. A minimal amount of normal plasma should be able to correct the coagulation time of hæmo-

philic plasma after recalcification: the same thing should not be true for the circulating anti-coagulants. If the test is done by means of the silicone technique, such a difference cannot be observed. For this reason only a different degree of severity should exist between the classical forms of hæmophilia and the so-called heparinoid or hæmophiloid.

The position of the thrombocytopenic purpura among the disturbances of blood coagulation needs some clarifying remarks. This concept has been introduced as a consequence of the knowledge on prothrombin consumption, and several investigators suggested the possibility of considering the thrombocytopenias among the diseases of blood coagulation.[1, 27, 36] Such a concept was at that time a complete renewal of the old points of view and it should lead us to minimize

Prothrombin utilization and platelets
during menses
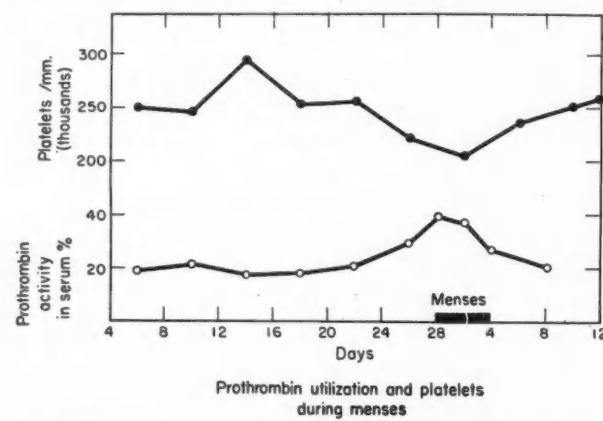
Fig. 4.—Decreased prothrombin utilization during menses.(49)

the other factors in thrombocytopenic purpura. In fact the platelet deficiency may cause hæmorrhagic diathesis also by other ways, especially in the phase of the adhesion of the thrombus to the tissues, which is in some degree equivalent in vitro to the clot retraction. Recently a definite demonstration has been given of the adhesion of the fibrin clot to the tissues in vitro after the addition of platelets.[45] Such data further support the concept of considering the thrombocytopenias not only among the diseases of the first phase of the blood coagulation, but also among the disturbances of the adhesion of the thrombus to the tissues.

From a general point of view the prothrombin consumption test allowed us to recognize many conditions of platelets deficiency or altered function, even in presence of normal or supernormal platelet count (thromboasthenia;[1, 26, 46, 47] polycythæmia, thrombocythæmia:[48] see also our

results of increased platelet function in these diseases[27]). A particular case of altered prothrombin utilization is represented by the menses, in which the hormonal influences may modify the platelet function[49] (Fig. 4) (see hypofollicolinæmic, hyperfollicolinæmic and hyperluteinic forms of the thrombocytopenic purpura[1]).

In addition to the forms caused by a deficiency in the first phase of the formation of thromboplastin, the forms caused by inhibition must also be considered. The existence of antibodies against the antihæmophilic globulin[50] appears to have been demonstrated only in a few cases, as the consequence of an immunological mechanism against the antihæmophilic globulin in transfused hæmophiliacs. The condition of inhibition of the platelet factor of thromboplastin belongs to the so-called "Hemmkörperhemophilie" of the German authors,[37] and needs some more documentation. The same is true also for the not yet well known inhibition forms of the converting[51] and accelerating factors (see for instance the impaired activation of the precursor of SPCA during irradiation[2]).

If we admit that an active thromboplastin does not exist in the blood, all forms of thromboplastin deficiency should be considered as secondary to deficiency either of the plasma or of the platelet factor of thromboplastin.

The congenital and acquired *deficiencies of the converting and accelerating factors* are already well known (see details in[1]). For the clinical evaluation of the converting factors we have today a method which can be used routinely and is quite reliable, *i.e.* the *method for the "quantitative determination" of factor VII.*[13] The technical details of the method are as follows:

The patient's oxalated plasma (9 c.c. blood + 1 c.c. 1.34% sodium oxalate solution) is diluted 1:10 with veronal buffer (Michaelis), of pH 7.35. In a test tube are mixed at 37° C.: 0.1 c.c. diluted plasma, 0.1 c.c. filtered oxalated ox-plasma (two filtrations through filters containing 20 and 30% asbestos respectively; kept in deep-freeze until used), 0.1 c.c. thromboplastin, and, after 20 seconds: 0.1 c.c. calcium chloride 0.025 M. With the same thromboplastin used in the one-stage method for prothrombin activity (normal prothrombin-time: 11½ seconds) the normal values to occur are 24 to 26 seconds. By further dilution of the normal plasma a standard curve is obtained which gives an approximately straight line on double logarithmic paper. The same values are obtained using normal serum. There is a little difference between the values for plasma and for serum if the concentration is higher than 10%. Storage of serum during four days in the ice-box and even when kept at room temperature does not significantly influence factor VII activity.

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Decreases of factor VII have been observed in liver diseases (Fig. 5) and during the treatment with dicoumarin derivatives.[13, 42] In this latter condition the determination of the converting factors such as factor VII has been recommended in order to obtain a safer control of the anticoagulant therapy, insofar as the modifications of the converting factors should be earlier and more marked than those of the prothrombin.[13, 42, 52] However, as the one-stage method is able to give us information about both prothrombin and converting factors, such a method can be

Factor VII activity in liver diseases

FIG. 5   Normal range

Factor VII activity in thromboembolic diseases

FIG. 6   Normal range
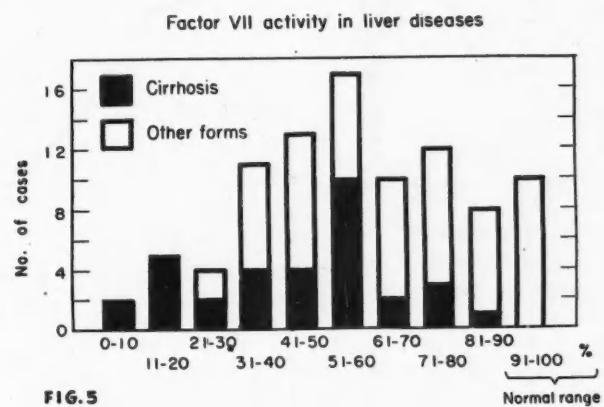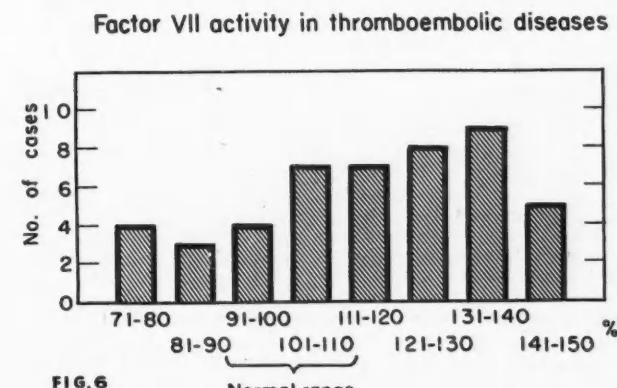
Fig. 5.—Decrease of factor VII activity in liver diseases. Fig. 6.—Increase of factor VII activity in thromboembolic diseases.

still used for the control of the therapy with dicoumarin derivatives. Conditions in which the converting factors are in excess have also been taken into consideration, as for instance late pregnancy[53] and thromboembolic disease (Fig. 6).

In the first phase of blood coagulation, that of thrombin formation, a further subdivision had not been considered until a few years ago, that of the *hæmorrhagic diseases caused by a relative calcium deficiency.* Definite evidence of hæmorrhagic diseases produced by very low calcium level has not yet been presented, not even in the experimental parathyroidectomy,[54] where a pro-

longation of the clotting time may be observed. Another condition could instead be taken into consideration, at least among the forms caused by a relative calcium deficiency, that is the one which occurs during the hypoprothrombinæmias due to dicoumarin derivatives and in other hypoprothrombinæmias. It has been shown that in such conditions minimal variations of the calcium concentration are sufficient to produce *in vitro* marked prolongation of the prothrombin time and of the whole blood clotting time, in contradistinction to the normal behaviour.[55, 56] These data have been confirmed also by means of the amberlite technique and in other forms of hypoprothrombinæmias (malignancies, liver diseases, etc.).[57]

The position of the *hypoprothrombinæmias* will be probably reviewed in the future in connection with the identification of the new factors and also with the improvement of methods for the determination of prothrombin level. This also applies for the control of anticoagulant therapy with dicoumarin derivatives, especially in connection with the safe and effective levels of hypoprothrombinæmias. During the last 2 to 3 years more information has been obtained about the sensitivity against dicoumarin derivatives, either by means of tolerance tests,[58, 59] or by using other control methods, such as the heparin tolerance test *in vitro*[39] or the clotting time in silicone tubes.[40 to 42] The former has been considered as safer than the prothrombin-time as concerned with the possibility of avoiding hæmorrhagic accidents. The latter allows us to detect the coagulation defect also in presence of an apparently normal coagulation time *in vitro*. During the treatment with coumarin derivatives, as well as during hepatic diseases, the difference between the increased clotting time in silicone tubes and the almost normal clotting time *in vitro* may be striking. The lack of wettable surface in the silicone tubes may play a part with the activation of some plasma factors, such as co-thromboplastin[12] or prothrombinogen,[16] and not only with the platelets (Fig. 7).

The position of the hæmorrhagic diseases correlated with a *defect in the second phase of the blood coagulation* does not present particular difficulties. The conditions which result in a secondary deficiency of thrombin have been already mentioned. The inhibiting conditions are chiefly represented by the heparin and heparin-like substances. While the hypocoagulability

syndromes caused by the injection of these compounds[60] or by release *in vivo* of heparin[61] (peptone shock) doubtless belong with this group, it is questionable whether it is true also for the hæmorrhagic diseases with circulating anticoagulants, which have been described during the last years. In such forms the possibility of shortening the clotting time by means of protamine *in vitro* or *in vivo* suggested the heparin-like nature of the anticoagulants.[62] But is it also possible that protamine either counteracts the anticoagulant activity of non-heparin-like substances or determines an increased coagulability by other ways (increased platelet function? see disintegration of platelets after addition of protamine *in vitro*[2]). From the therapeutic point of view protamine gave us good results especially in acute leukæmias with prolonged clotting time,

sistently counteract the anticoagulant effect in a very short time[63] (Fig. 8).

In the field of the *fibrinogen alterations,* beside the congenital and acquired deficiencies, the afibrinogenæmia after placentæ abruptio as a consequence of intravital defibrination repre-
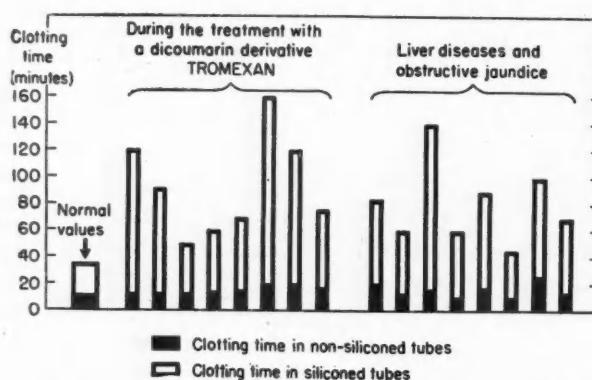
Fig. 7.—Apparently normal clotting time during the treatment with dicoumarin derivatives and in liver diseases. Detection of the defect by means of the silicone technique. (42)
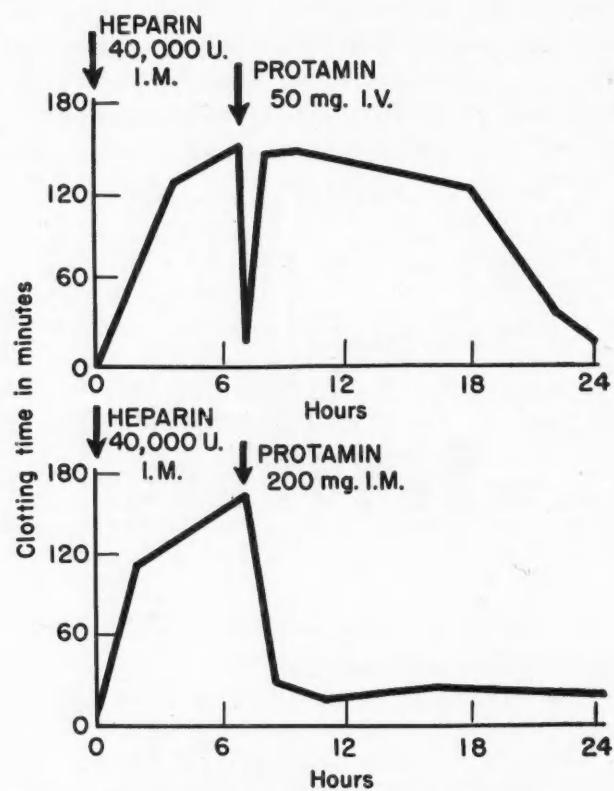

Fig. 8.—Transitory effect of intravenous protamine during the treatment with long-acting intramuscular heparin. Consistent effect of concentrated intramuscular protamine in the same conditions.

Phase of the defect	Disease
I. Thrombin formation	
1. Thromboplastin	
a. Plasma factor	Hæmophilia
b. Platelet factor	Thrombocytopenias; thrombopathies (partim)
2. Converting factors	Congenital and acquired def.
3. Accelerating factors	
4. Calcium	Relative calcium deficiency
5. Prothrombin	Hypoprothrombinæmias
II. Fibrin formation	
2. Thrombin	Hyperheparinæmias
2. Fibrinogen	Congenital and acquired def.
III. Clot retraction and adhesion of the thrombus to the tissues	Thrombocytopenias; thrombopathies (partim)
IV. Fibrinolysis	Increased fibrinolytic activity

and if administered intramuscularly in concentrated solution (depot-therapy with protamine).[63] In fact the intravenous protamine has in such forms only a short effect. The same is true for the hypocoagulability tendency produced by intramuscular concentrated heparin, in which the intramuscular protamine is able to con-

sents a newly described condition,[64] which has its experimental equivalent in the fibrinogenopenias due to thrombin infusion.[65, 66]

The diseases correlated with the third phase of blood coagulation have been already mentioned and discussed. In the last phase of blood coagulation, fibrinolysis, many observations of

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increased fibrinolytic activity were associated with hæmorrhagic tendency. A causal correlation between these two conditions is very probable (see details in[1]).

In the next scheme a simplified classification of the diseases of the blood coagulation has been presented. Some forms have been omitted, especially among the inhibition forms. Such classification is only tentative, but it reflects the efforts which have been made in order to establish more and more close connection between the findings of physiology and the clinical point of view.

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During the past decade there have been two opposing ideas of the general character of medical education. One idea is to break down departmentalization of medical knowledge and to focus attention increasingly on the patient as a whole and on the patient as an individual human being. The other idea is to expand the compartmentalization of teaching. For example, all deans have in the last few years received questionnaires from many different specialty groups—industrial medicine, legal medicine, oncology, chest diseases, etc. There is the clear implication that each of these subjects is important and that, for most, there should be a definite and separate course for medical students. More recently there have been requests or demands for integrated or separate teaching of knowledge related to atomic warfare and civilian defence.

There is little doubt that each of these subjects is important. There is also little doubt that the scope of medicine is widening and that medical schools must adapt themselves to the broadening horizon and changing concepts. On the other hand a proper consideration of the place of each facet of medical care and service must be evaluated in terms of the primary objective of undergraduate medical education in contrast with postgraduate medical education.—From *The Journal of Medical Education,* January, 1952.

RESULTS OF SURGICAL TREATMENT OF CANCER OF THE LARYNX

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CANCER OF THE LARYNX is one of the most readily curable malignancies encountered in the body. It includes malignant growths from the tip of the epiglottis to the inferior margin of the cricoid cartilage.

The deaths from cancer of the larynx over a ten year period in Canada and the Province of Ontario were as follows:

TABLE I.

	1938–42	
	Canada	Ontario
Total number of cases	581	201
	Male......477	Male......163
	Female....104	Female.... 38
	1943–47	
Total number of cases	641	252
	Male.....524	Male.....198
	Female....117	Female.... 54

Cancer of the larynx is not an uncommon disease, as seen from the statistics mentioned above and from the fact that about 850 laryngectomies are performed yearly in the United States. It comprises about 2% of all human malignant tumours, occurring most often in the fifth and sixth decade of life, predominantly in males in the proportion of 10 or 12 male to 1 female. We must remember that cancer of the larynx is no respecter of age. Walsh reports two cases of laryngeal papilloma, one a boy 13 years of age and another a girl 12 years, in which both received a small amount of radiation therapy to the larynx following which the pathologic study proved these growths to be epidermoid carcinoma. Orton reports a case in a boy of 13 years. The youngest in my series was 20 years and the oldest 82 years of age.

These figures mentioned previously do not give us as valuable information as we desire, as we do not know the number of intrinsic and extrinsic growths, but we may presume that their incidence is about equal.

Cancer of the larynx—intrinsic.—This includes growths arising on the vocal cords, ventricles or subglottic region.

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Cancer of the larynx—extrinsic.—These growths include those arising on the upper surface of the ventricular bands, the epiglottis, ary-epiglottic folds, pyriform sinus or in the post-cricoid region.

A further classification should be made based on the anatomical location of the malignant growth in the laryngo-pharynx. Wide variations as to end results are published, even in intrinsic growths depending on the anatomical location. For example note should be made if the malignant growths arise from the true cord or from the ventricle or subglottic region. If from the ventricle the pre-epiglottic space is invaded earlier, and they are often undifferentiated in type and are discovered late. Subglottic growths also as a rule are discovered later and spread to the regional lymph glands. Therefore the latter two sites of malignant growths do not offer as favourable a chance of cure as those arising from the true cord.

It should be observed in the extrinsic malignant growths, if the epiglottis is invaded, whether or not it arises from above the hypo-epiglottic ligament. If so, the epiglottis may be removed by a lateral pharyngotomy. Whereas if the growth is below the hyo-epiglottic ligament the larynx must be removed as the pre-epiglottic space is invaded early in the disease. If the growth arises in the ary-epiglottic fold and seen early it can be removed by a lateral pharyngotomy but as a rule by the time the patient presents himself, the growth has progressed to such an extent that a wide excision of the larynx, the hyoid bone, pre-epiglottic space and perhaps some of the lateral wall of the pharynx must be removed. If the growth involves the posterior or lateral wall of the pharynx including the post-cricoid area, and if seen early it may be removed by a lateral pharyngotomy: if extensive, a laryngo-pharyngectomy may be necessary. The cervical glands can be removed at the time of the operation and if necessary a plastic reconstruction done at a later date.

Carcinoma of the larynx with metastatic involvement of the cervical glands should not be regarded as inoperable, as a block dissection may be carried out at the time of the operation. The same holds true of metastatic involvement of the cervical glands soon after, or even years following a laryngectomy. A bilateral block dissection of involved cervical glands may be carried out, with an interval of two weeks between

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each resection. Block dissection of the lymphatic bearing tissues of the neck will probably cure more patients with metastatic carcinoma in this area than will any other procedure.

If such a classification based on the anatomical location of the malignant growth were used, there would be a better understanding or appreciation of the operative end results. There would not be published such a wide variation of end results in laryngeal cancer, and the extensive surgery often necessary in the extrinsic group would appear justified.

The histological structure of malignancy attacking the larynx is predominantly the squamous cell type.

It is alarming to review the histories of a great number of patients suffering from cancer of the larynx and discover that many patients did not have the correct diagnosis made, or that it was too late for a laryngo-fissure or even a laryngectomy. There is probably no anatomic form of cancer in which avoidable delay in diagnosis may be more readily demonstrated than in cancer of the larynx. This is especially true of the intrinsic type arising from the vocal cord which is the most easily diagnosed of all cancers of the body, as hoarseness is invariably present in the early stages and is the one and only symptom.

Realizing as we do that persistent hoarseness is of serious consequence the lack of early diagnosis is apparent from the number of laryngectomies performed. Progress of the disease is slow and hoarseness may persist as the only symptom from one to three years in untreated cases before the airway is diminished sufficiently to produce dyspnœa. Eventually the disease may perforate the laryngeal cartilages or cricothyroid membrane to invade the soft tissues of the neck. Metastasis to the cervical lymph nodes is late. When we think of the insidious onset and lack of symptoms of cancer in other parts of the body namely the œsophagus, stomach or lungs or even the extrinsic group of cancer of the larynx, it becomes more apparent that the patient has every right to an early diagnosis especially in the intrinsic group with cord involvement.

A review of a large number of cases of intrinsic laryngeal cancer reveals that the majority of patients with persistent hoarseness will consult a doctor within eight weeks. Accurate diagnosis should be made though occasionally repeated biopsies may be necessary. Failure of the physician to carry out this investigation gives the patient false security regarding his hoarseness and he tends to delay in many cases for months or even one or two years before seeking further relief.

Numerous lesions occur in the larynx which may simulate cancer clinically, such as polyps, keratosis, papilloma, tuberculosis and syphilis. It is often difficult even for the thoroughly experienced to make a correct clinical diagnosis. It is only by microscopic examination of a biopsy that a correct diagnosis can be made, which is carried out most easily by direct laryngoscopy under local anæsthesia.

The operative mortality in either laryngofissure or laryngectomy should not be greater than that incidental to any operation. Previous to the days of chemotherapy and antibiotics an operative mortality of 10 to 20% was not uncommon in laryngo-fissure and 47 to 60% operative mortality in laryngectomy. The end results, i.e., five year cures now vary from 85 to 95% in laryngo-fissure and from 60 to 90% in laryngectomies depending on the anatomical location of the growth.

During the period from September, 1944 to December, 1950 inclusive the writer has operated on 120 patients with cancer of the larynx of which 109 cases or 91% were male and 11 or 9% female. There were 103 intrinsic cases or 86%. All the patients with the exception of one Chinese were of the white race. A positive Wassermann was only found in one case, and one other case gave a history of having been treated for specific disease.

There were 78 laryngectomies performed in this period and 40 laryngo-fissures. This brings out the lack of appreciation regarding persistent hoarseness by the patient, but the responsibility for the delay in treatment does not rest solely on the patient. The onus must be on the physician in not recognizing the true nature of the disease and in not providing adequate treatment.

Postoperative complications occurred in three cases, all vascular in origin. One was a coronary thrombosis ten days following operation, one a cerebral thrombosis two days after operation, and lastly one died from a massive hæmorrhage two weeks following operation having previously received two courses of x-ray therapy.

Twenty-three of these cases can be reported upon five years following operation, two laryngo-

fissures and twenty-one laryngectomies. Four-teen of these are alive and well five years follow-ing operation. Seven have died. An analysis of deaths shows the following facts.

TABLE II.

23 cases		Deaths
Laryngo-fissures.......... 2		0
Laryngectomies.......... 21		7

Causes of death
(a) Vascular—Cerebral thrombosis............. 1
　　　　　　Coronary thrombosis............ 1
　　　　　　Hæmorrhage following x-ray
　　　　　　　　therapy.................. 1
(b) Secondaries—
　　　　　　Subglottic.............. 1
　　　　　　Extrinsic.............. 1
　　　　　　Intrinsic................ 2

All the deaths occurred in patients that had a laryngectomy performed; in other words 14 out of 21 laryngectomies are alive and well five years after operation or 67%.

SUMMARY

Cancer of the larynx is not an uncommon dis-ease. It is vital that early diagnosis should be made and with the aid of chemotherapy and antibiotics operative procedure has reduced mortality.

Cancer of the larynx is more common in the male than female. In laryngo-fissures one may expect five year cures in 85 to 95% and from 60 to 90% in laryngectomies depending on the anatomical location of the growth.

170 St. George St.

PRESACRAL INSUFFLATION OF OXYGEN FOR OUTLINING THE CONTENTS OF THE RETROPERITONEAL SPACE*

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THERE ARE SOME urological cases in which the diagnosis remains obscure or uncertain after a detailed investigation, including intravenous and retrograde pyelography. In these cases, pre-sacral insufflation of oxygen is often of great value in clarifying the diagnosis. The oxygen in-jected diffuses around the kidneys and adrenals, giving a clearly defined outline of these organs. If now retrograde pyelography is done, diagnosis may be simplified.

The development of this technique is of interest. In 1921 Carrelli in Argentina and Rosenstein in Germany introduced air into the perirenal space by inserting a needle in the lumbo-costal angle, thereby perforating the various muscle and fascial planes encountered, until the space surrounding the kidney was reached. When this space was reached, air was injected. This method outlined the kidney and adrenal, but left much to be desired in the technique, as the position of the point of the needle was often a matter of conjecture. In spite of this, the method came into fairly wide use as a diagnostic aid until it became apparent

that there were many fatalities, usually due to air embolism. The procedure was particularly dangerous in cases of renal neoplasm, where large distended veins coursed the surface of the tumour. Many of the deaths were due to the needle entering one of these thin-walled veins, the air being injected directly into the circula-tion. In addition, it was difficult technically to introduce the air into the correct tissue plane by this lumbo-costal approach. The diffusion of gas was not even, and if both sides were to be demonstrated, the injection had to be re-peated on the opposite side. In cases of ptosis or ectopy, the procedure failed entirely. For these reasons, the procedure gradually fell into disuse.

In 1947 Ruiz Rivas in Spain developed an ingenious approach to the problem of adequately and safely outlining the kidneys, adrenals and other retroperitoneal structures by applying cer-tain well known anatomical facts. He observed that the perirenal fascia (Gerota's) has an anterior and posterior layer, which fuse with each other at the lateral margin of the kidney and above the adrenal gland, before gaining attachment to the diaphragm. Medially, the pos-terior layer fuses with the periosteum of the vertebral bodies and the intervertebral discs. The anterior layer is continuous with the layer of the opposite side, passing in front of the vertebra and aorta, being firmly adherent to the latter, so that for practical purposes it may be regarded as being closed medially. The two layers remain separate below, thinning out and finally disap-

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pearing in the loose retroperitoneal areolar tissue of the iliac fossa. They can therefore be likened to two inverted sacs closed laterally, medially and superiorly, and open inferiorly. This retroperitoneal space continues downwards to the hollow of the sacrum. In this region in the midline there are no important structures. The area is relatively avascular. Making use of these anatomical facts, Rivas introduced air into the loose areolar presacral tissue and allowed it to diffuse upwards retroperitoneally between the two layers of Gerota's fascia. By this means he was able to outline the kidneys and adrenals. The spleen and liver are also frequently outlined.

the morning, the bowel is usually relatively free of gas. If the procedure is delayed, the patient may be nervous and swallow a considerable amount of air, which in turn tends to obscure the kidney shadows.

APPARATUS

The apparatus to be used (Figs. 1 and 2) is found in any hospital. It consists of a No. 20 lumbar puncture needle, a metal adapter, a few lengths of thick walled rubber tubing, a three way stopcock, a 50 c.c. metal tipped glass syringe, a glass tube stuffed with cotton (filter), an oxygen cylinder with reducing valve, a hypo-

Fig. 1

Fig. 2

Fig. 1.—This shows the knee chest position assumed by the patient, the relationship of the needle to the coccyx, and all the necessary apparatus. Fig. 2.—This lateral view of the sacrum and coccyx shows the needle in the presacral space. Observe the large space between rectum and sacrum. The only vessels of any size here are the superior hæmorrhoidal artery and the median sacral artery, as shown.
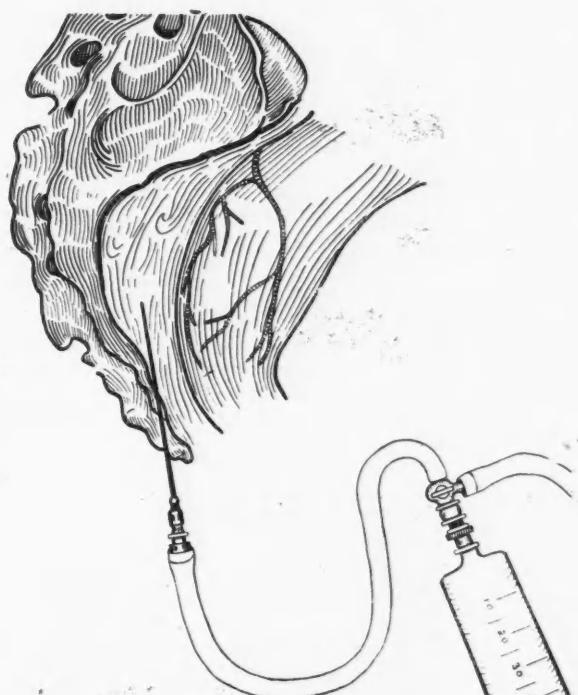
TECHNIQUE OF PRESACRAL INSUFFLATION
PREPARATION OF PATIENT

At 4 o'clock of the afternoon prior to the insufflation, the patient is given one-half ounce of licorice powder. Fluids are restricted after 8 p.m. At 6 a.m. the patient receives nembutal gr. 1ss and at 7 a.m. morphine and hyoscine in an amount proportionate to his age. At 8 a.m. the insufflation is done. An intravenous pyelogram series, or cystoscopy with retrograde pyelograms follows in half an hour. The patient may walk about during the waiting interval, thereby helping the oxygen to diffuse in the retroperitoneal spaces. By carrying out the procedure early in

dermic syringe and needle, 1% procaine solution, merthiolate, gauze squares, two sterile towels, and a pair of sterile gloves.

METHOD OF INSUFFLATION

The patient is placed in the knee-chest position (Fig. 1) and the sacrococcygeal and surrounding area is cleaned and painted with Merthiolate solution. The patient is draped with sterile towels. The skin and subcutaneous tissue just lateral to the tip of the coccyx is infiltrated with 1% procaine. A No. 20 lumbar puncture needle is inserted about 1 cm. lateral to the sacrococcygeal joint, in an upward, medial, and

forward direction. When the end of the needle is felt to be in the sacral hollow, 1,000 c.c. of oxygen are slowly injected. This diffuses upwards and surrounds the kidneys and adrenals. The positioning of the patient controls the diffusion of gas.

MODIFICATION OF TECHNIQUE

We have altered Rivas' technique as follows· With the patient in the knee-chest position, the

rotated through a complete circle whilst constant aspiration is maintained on the syringe. This is done to make certain that the needle has not penetrated a vessel. Should blood be aspirated, the position of the needle must be changed. The area is relatively avascular, and to date we have not encountered blood. To prevent movement of the needle during the injection, it is connected to a length of rubber tubing which in turn is connected to a three-way stopcock, the other
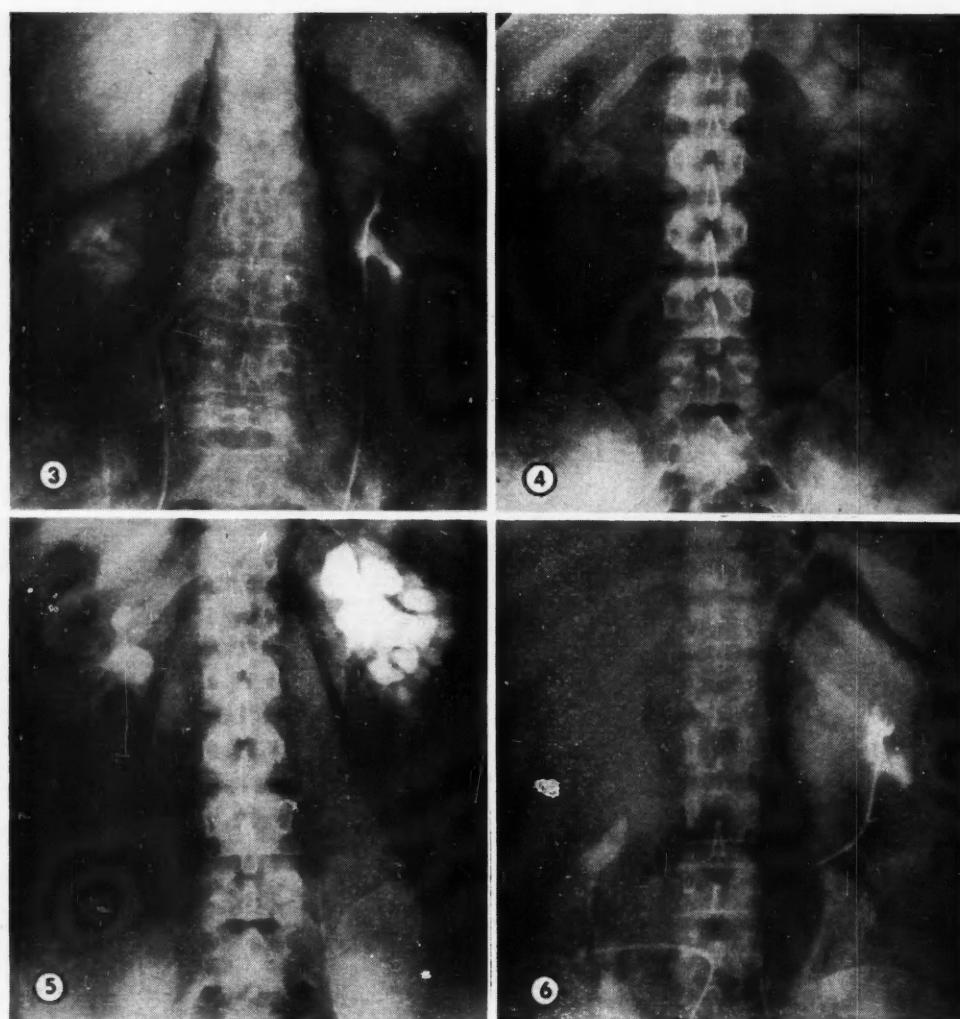
Fig. 3.—This is a retrograde pyelogram taken after insufflation of 1,200 c.c. of oxygen in a normal subject. **Fig. 4.**—This is an intravenous pyelogram taken of J.S.L. showing a normal right kidney and a large hydronephrosis on the left side. **Fig. 5.**—Same patient as Fig. 4. Retrograde pyelogram after presacral oxygen insufflation. Note the clarity of definition of renal outlines of this as compared to Fig. 4. **Fig. 6.**—This is a retrograde pyelogram after oxygen insufflation of Y.W., showing marked bilateral renal enlargement interpreted as representing polycystic disease of kidneys.

needle is inserted beneath the tip of the coccyx (Fig. 2) and advanced 4 cm. along the midline, in a superior and posterior direction, following the hollow of the sacrum. With the patient in the knee-chest position the needle is almost parallel to the floor. When the needle is inserted into what is thought to be the correct space, a syringe is attached and the needle

arms of which are connected to the syringe and to the oxygen supply. A cotton filter intervenes between the oxygen tank and syringe to eliminate any foreign matter. The syringe is filled with an intermittent flow of oxygen. Each 50 c.c. is injected slowly. At first there is a sense of resistance to the injection, but after a 100 c.c. or so, the resistance gives way and the injection

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is effortless. Between 1,000 and 1,500 c.c. of oxygen are injected, depending upon the size of the patient. On completion of the injection, the patient is turned on his back and made to sit up and lie down ten times. This is usually enough to ensure diffusion of the oxygen. A flat plate is taken to determine the state of diffusion and then either an intravenous pyelogram series or cystoscopy with retrograde pyelograms is done. The latter is preferable as it gives better results due to better filling of the pelvis and calyces and the better contrast between the dye and surrounding gas (Fig. 3).

BLACKWOOD MODIFICATION

Blackwood in 1951 modified Rivas' technique by placing the patient in the lateral position with the knees and thighs fully flexed. He inserts the needle ½ cm. anterior to the tip of the coccyx in the midline and directs it in a superior and posterior direction with the right hand. While the needle is being positioned, the gloved left index finger is placed in the rectum to determine the location of the needle and insure its proper placement in the hollow of the sacrum without penetrating the rectum. He then injects 300 c.c. of air and waits three minutes for it to diffuse. This insufflates the side which is up. With the needle in position the patient is then turned on the opposite side and the injection repeated.

We have tried both these methods, but prefer our own modification. The reason for this preference is that the Rivas method necessitates directing the needle in an anterior direction with the obvious risk of penetrating the rectum. It is difficult to be sure that the needle tip is in the correct tissue plane, especially in obese patients. Blackwood's method with a finger in the rectum avoids the danger of penetrating the rectum, but is awkward for both patient and operator. It is difficult to insure that the needle will maintain its position while the patient changes sides. Further, since one side of the retroperitoneal space has been opened by the initial injection, subsequent injections with repositioning of the patient will tend to make it easier for the oxygen to track up the side already opened and result in a one-sided insufflation. This is contrary to Blackwood's claim. We are of the opinion that the method we use, described above, takes advantage of the merits of the other two methods and avoids their disadvantages.

COMPLICATIONS

We have done 20 presacral insufflations of oxygen and have to date encountered only one complication. In this one patient, surgical emphysema up to the neck developed. This was absorbed in twenty-four hours without any special treatment except for Aspirin and codeine for the relief of the discomfort.

Other complications which one might reasonably expect, such as hæmatoma, infection, shock, or severe pain at the site of injection have not occurred. So far as we know, air embolism has not occurred in any patient, or at least there has been no clinical suggestion of such. Almost all patients complain of feeling distended, but this soon passes off. About half the patients have complained of pain in the tip of the shoulder. This is due to diaphragmatic irritation. It also soon disappears.

CASE 1

J.S.L. This 19 year old male was admitted to the Royal Victoria Hospital on October 22, 1951, complaining of pain in the right loin radiating up to shoulder and down the front of the right thigh. In the preceding 18 months he had had several bouts of dysuria and frequency. He had had previous urological investigation and had been told that there was nothing to be done. At the time of admission to the hospital his right-sided pain had become severe. The physical examination was normal throughout except for costovertebral tenderness on the right side. Urinalysis at this time showed albumen negative, sugar negative, microscopic—rare epithelial cell only. The blood N.P.N. was 28 mgm. %. An intravenous pyelogram was done and showed a large hydronephrosis on the left side (Fig. 4). To better outline the kidney 800 c.c. of oxygen were injected presacrally, and retrograde pyelograms made 15 minutes later. The kidneys were well outlined (Fig. 5). The right-sided pain was due, we believe, to compensatory hypertrophy of the right kidney. Nephrectomy on the left side was subsequently performed, the above findings being confirmed.

CASE 2

Y.W., a 58 year old male was admitted to the Royal Victoria Hospital on November 12, 1951, to the surgical service for investigation of loss of weight, nausea, vomiting, constipation and right flank pain. Examination of the abdomen showed an enlarged mass in the kidney region on each side. On the right side the mass was hard and fixed and extended from above the right costal margin to the iliac crest. Urinalysis showed a rare RBC and WBC. The blood N.P.N. was 194.5 mgm. %, the creatinine was 8.08 mgm. %. 1,200 c.c. of oxygen were injected in the presacral region and retrograde pyelograms were made. A diagnosis of polycystic disease of the kidneys was made, and the patient was discharged from the hospital. Six months later, when visited at home, the patient was still alive with no change in the clinical picture (Fig. 6).

CASE 3

C.L., a 49 year old woman was admitted to the Royal Victoria Hospital on November 26, 1951. She complained of intermittent pain in the left lower quadrant of the abdomen, without radiation. She had suffered from intermittent discomfort in her left loin and back for the past 14 years; it was moderate in degree. In the

past year, the pain had been getting worse and changed from the left loin to the left lower quadrant of the abdomen. There were no other urinary complaints. She voided day 5 x; night—zero. There was no burning on micturition. The past history, family history and functional enquiry were non-contributory. The only positive finding on physical examination was a palpable mass in the left upper quadrant which was thought to be kidney. Urinalysis showed a rare pus cell and a rare red blood cell. The P.S.P. excretion was 60% in 2 hours. The N.P.N. was 29.4 mgm. %. The creatinine was 1.42 mgm. %. Urine culture showed a light growth of micrococci and diphtheroids.

An intravenous pyelogram series showed a large round mass in the left upper quadrant of the abdomen without any secretion of dye on the left side (Fig. 7). The pyelogram on the right side was normal in appearance. On November 28, 1951, 1,200 c.c. of oxygen were introduced into the presacral space and retrograde pyelography was done. These films showed the large hydronephrosis of the left kidney. A left nephrectomy was performed December 3, 1951, confirming the diagnosis.

DISCUSSION

Presacral perirenal oxygen insufflation provides valuable information about the size, shape and outline of each kidney. In addition, the adrenals, the liver, and the spleen are frequently clearly outlined. Such clearly defined outlines are unobtainable by any other equally simple method. In the past quarter century, the value of perirenal oxygen insufflation has been realized, but due to the very real danger and technical difficulty of performing this through the lumbar approach the method was largely discontinued. By the presacral route one injection suffices to insufflate both sides, and except for rare occasions both the kidneys and adrenals are

Fig. 7   Fig. 8

Fig. 7.—This is a retrograde pyelogram after insufflation of 1,200 c.c. of oxygen, of C.L., showing a normal right kidney and marked left hydronephrosis. **Fig. 8.**—Semilateral view of J.C., showing well circumscribed mass, believed to be a cyst from lower pole of right kidney.

CASE 4

J.C., a 56 year old male was admitted to the surgical service of the Royal Victoria Hospital on March 4, 1952, complaining of abdominal enlargement. He was very obese, weighing 263 pounds, so that all that could be said on physical examination is that there was a suggestion of a mass in the right upper quadrant of the abdomen. The hæmogram and blood chemistry were essentially normal. A barium enema was done. The radiologist's report of this read "a gross, relatively homogeneous tumour is present, arising from the right paravertebral fossa and displacing the stomach and small bowel, particularly the descending portion of duodenum downwards and to the left. There is no demonstrable connection of this mass with the alimentary tract."

1,800 c.c. of oxygen were introduced into the presacral space, following which 20 c.c. Diodrast were given intravenously. The films showed a normal contour to the upper two-thirds of the right kidney, and a large cyst arising from the lower third of the right kidney and extending downwards to one inch below the iliac crest (Fig. 8). A diagnosis of solitary cyst of the kidney was made. This was subsequently confirmed at operation a few days later, at which time the cyst was excised. The postoperative recovery was uneventful.

well demonstrated. In cases of ptosis or ectopy this is the only way to insufflate the perirenal space. Since the injection is made through a relatively avascular area, the possibility of an air embolism is quite remote.

We prefer to use oxygen, feeling that it is safer to introduce a gas which the body can readily use and quickly dispose of. Air insufflation is used by many. Levine uses helium, claiming faster diffusion and better contrast. This dubious advantage is more than offset by the fact that oxygen is found in all hospitals, whereas helium is in only a few. Further, the simpler the method the more widespread its use.

In our opinion the method of presacral oxygen insufflation is easy to perform, is reliable, and most important of all, is extraordinarily safe.

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It is probable that its use will become widespread once these facts are fully appreciated.

Summary

1. The historical development of perirenal insufflation is discussed.

2. Rivas' technique for the presacral insufflation of oxygen to outline the contents of the retroperitoneal space is recorded.

3. A variation of this technique which we have found very satisfactory is also recorded. Representative cases are reported.

4. Air, oxygen, or helium may be used as the gas for the insufflation. The authors prefer oxygen.

5. The fact that the method is extraordinarily safe, easy to perform, and reliable, should lead to its widespread use.

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PSYCHOSIS OCCURRING POSTPARTUM: ANALYSIS OF 34 CASES[*]

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It is common knowledge that the lay public and many medical men alike are prone to attribute to the climacteric all personality disorders occurring between the ages of maturity and senility. Another causal association has been formed by the public between psychiatric illness of the child-bearing age and parturition. One of the referring doctors in the series of cases presented here subscribes to this view, as shown in the following extract from a social worker's report: "Worker also got in touch with patient's local doctor who says her present psychosis is due to pregnancy, and is hereditary as her mother had a similar condition with pregnancy. The doctor thinks that because of this it would be a good thing if the patient were sterilized."

Since one person in 10 comes for psychiatric treatment at some time during a life span and since about half of these are women, many of whom have borne children, it follows that many mothers become mentally ill. Smalldon[1] reports various authors who state 3 to 10% of psychotic persons belong to the puerperal group. We have endeavoured to study our hospital records for those cases in which there appeared a definite sequential relationship between delivery and the onset of psychosis and in which the attending doctor and family have attributed the mental breakdown to parturition, its attendant physical and social complications and responsibilities.

Altogether there are 36 patients for discussion and in those cases where the records are complete striking similarities have been found to exist in some aspects of the case studies.

Definition

For inclusion in this series patients met the following criteria: (1) First attack of mental illness directly following childbirth. (2) Prenatal psychotic symptoms absent even in retrospect. (3) Admission to psychiatric hospital ward within one year after parturition. (4) Toxæmia of pregnancy not apparent or minimal.

The series to be discussed comprises all cases of psychosis occurring postpartum admitted to the Provincial Mental Hospital and the Crease Clinic, Essondale, between March 1, 1944 and September 30, 1951. During this seven and a half year period only two patients admitted were diagnosed as pre-eclamptic. The remaining 34 patients showed no toxicity as measured by physical signs or in the characteristics of the psychosis, and it is the latter group that has been studied in detail. The author had personal knowledge of all the patients under consideration.

Classification

Under the International Nomenclature our 34 patients would classify as schizo-affective psychosis, although it must be acknowledged that the favourite diagnosis at the time of treatment was often catatonic schizophrenia. Also in the International Classification there appears: "Psychosis of pregnancy" and "Puerperal psychosis" under

"Deliveries and Complications of Pregnancy, Childbirth and the Puerperium". No mention is made of these classifications under the "Classification of Mental Disorders"; they are valid only as a disposal diagnosis, equivalent to saying "referred to psychiatry". Strecker and Ebaugh in 1926 and other authors since have shown there is no such psychiatric clinical entity; nevertheless Index Medicus collects the references under "puerperal insanity".

Four of the patients did show physical findings of toxæmia either on the obstetrical ward or following admission for psychiatric care, but the greatest recorded abnormality for each of these women was as follows: (1) B.P. 148/94, trace alb. (2) "Dependent œdema". (3) B. P. 142/100, faint trace alb. (4) B.P. 148/102, alb. negative. These four could not classify therefore as psychosis of demonstrable etiology, or psychosis with other somatic disease, e.g., psychosis due to cardio-renal disease.

It is assumed that affective and neurotic reactions which may have occurred during the years under consideration were treated in hospital services nearer the community. Only one neurosis precipitated by childbirth was admitted to our hospitals during that time and no affective psychoses. More recently there has been a definite representation of the last mentioned illnesses.

Onset.—In 21 cases the onset of illness was acute and dramatic within ten days following delivery. An additional 5 cases suddenly developed illnesses similar in character two to eleven months after delivery. The remaining 9 cases developed more insidiously over three to twelve months after childbirth.

Frequency.—Only 3 patients suffered multiple post partum psychosis, 1 having two attacks and 2 having three.

Age.—No patient was under 21 and none over 39 in the series; 24 out of 34 were 25 and over at the time of first attack. Excluding 2 of the women with multiple admissions over a span of years, 14 of the group out of 32 were 30 and over.

Parity.—Again excluding cases of multiple admissions, 19 out of 32 were primiparæ; 3 of this group have been known to bear subsequent children uneventfully. Doubtless others have been discouraged from further attempts.

Sex of child.—21 out of 32 were girls.

Sibling relationship of patient.—The records are incomplete in this respect for 2 patients. Of the remaining 32 women, 15 were the youngest daughter and an additional 9 were the only daughter.

Family psychopathology (psychosis, suicide, alcoholism).—This was present in 12 patients in the group although the mother had a similar illness in only one case, namely that referred to in the introductory comments.

Hazards.—7 patients in the group made genuine suicidal attempts: 3 more threatened suicide and 3 made homicidal attempts.

Duration.—The illness is a protracted one, only 3 patients spent less than 3 months in our hospitals (67, 73 and 75 days respectively); the longest hospital stay was 372 days.

Treatment.—14 had had a course of electro shock therapy (E.S.T.) before admission and had relapsed, 6 of these had a second course with relapse. Our basic treatment was a combination of insulin coma and electro shock therapies in most cases. All 34 had insulin, 27 had E.S.T. as well; 22 patients had over 50 daily insulin treatments, a maximum being 143 days; 28 had over 30 hours of "light coma" (no response to verbal stimulus yet corneal reflexes preserved) the maximum being 143 hours.

Medical treatment for dehydration and often for secondary anæmia was necessary in the acutely disturbed patients. Nine patients received in addition interview psychotherapy and 3 attended group psychotherapy. Three of the multiparæ were sterilized. Occupational therapy provided an important outlet to appease aggrieved maternal impulses. Rehabilitation is no great problem, for in this illness as in no other psychiatric illness the family rally around and offer much reassurance and support.

Symptomatology.—Four cases are presented in summary below, two typical cases illustrating patients having an acute onset of illness directly post-partum, one with an acute onset after an interval, and one showing an insidious onset.

Case 1 (Acute Onset)

Mrs. J.G., age 29, multipara, youngest daughter in the family, delivered normal female child, onset of illness 5 days after delivery, re-admitted to general hospital and from there admitted to mental hospital two weeks after delivery on August 16, 1950.

Propensity.—Excited, aggressive, destructive, talkative, remorseful, religious delusions.

No toxicity. One brother suicide.

Treatment.—(1) E.S.T. 2 courses with 8 and 12 induced seizures, respectively. (2) Insulin coma therapy (I.C.T.) August 1950 to December 1950; 94 days of treatment, 62 comas, 71½ hours of coma. Illness protracted by death of child during patient's hospitalization. Discharged from hospital, recovered, May 7, 1951.

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Psychodynamics.—Father rigid, domineering, brutal: ridiculed patient, who in her home was shielded by an elder sister and became submissive, over self-critical with strong inferiority feelings. She had a secret marriage outside the R.C. church. She suffered nausea and vomiting throughout pregnancy. While pregnant she routed a thug's attack on herself and her husband. There was a difficult delivery with hæmorrhage and transfusions. A priest visited her postpartum, and she reported him as saying she was not married. She showed anxiety postpartum which panicked her husband. As her illness developed momentum her husband became indecisive, did not assume responsibility and her elder sister took over.

CASE 2 (Acute Onset)

Mrs. D.G., age 24, primipara, youngest daughter in family, delivered a normal female child. Onset of illness 7 days after delivery and admission to mental hospital 4 days subsequently on May 19, 1951.

Propensity.—Depressed, often mute, self-blaming, suicidal attempt by barbiturates and throat slashing, religious ruminations.

B.P. 125/90, albumen negative. No diagnosed psychiatric disorder in family.

Treatment.—(1) E.S.T. 3 courses with 8, 7, and 5 induced seizures respectively. (2) I.C.T. May 1951 to August 1951, 74 days of treatment, 65 hours of coma. (3) Group psychotherapy.

Discharged socially recovered August 30, 1951.

Psychodynamics.—Father successful businessman, autocratic in own home. Family loyalty lines drawn, father to sister, patient to mother; close identification with mother who was talented and autistic like herself. Hurt by mother's death when she was 15. Excessive needs for affection, strong likes and dislikes, war bride of husband whose mother still dominated him. Baby premature and failing, security threatened by baby's precarious state and husband's divided loyalty between her and his mother.

CASE 3 (Insidious Onset)

Mrs. J.G., age 29, multipara, youngest daughter in family, delivered her third child, a normal male infant and entered our hospital four months subsequently on September 5, 1950, having gradually slipped into her illness.

Propensity.—Ideas of food poisoning, withdrawn, vague, indecisive, auditory hallucinations and religious preoccupations, aggressive verbal attacks, suicidal attempt by taking overdose of pills. Symptoms more diffuse and less in relief than in the illness of acute onset.

No diagnosed psychiatric disorder in family. No toxicity.

Treatment.—Before admission to mental hospital patient received a course of E.S.T. in a private hospital with improvement and relapse. (1) I.C.T. September to November 1950. 40 treatment days, 36 comas, 50 hours of coma. (2) Social Service interviews following discharge home.

Discharged recovered November 17, 1950.

Psychodynamics.—Submissive, timid young woman regarded as the baby of the family. She continued to miss her mother 11 years after her death and identified with and felt rivalry towards older sister, always tried to do what she did, was jealous of her; felt the sister was better looking, even married the brother of sister's husband, a man 10 years her senior; conceded to sexual relations with sister's husband. Patient questioned paternity of her child and expressed guilt feelings in this regard.

CASE 4 (Acute onset after an interval)

Mrs. M.T., age 28, primipara, youngest daughter in the family, delivered a normal female child by Cæsarean section. Admitted to mental hospital October 1, 1950, 3½ months after delivery, having become acutely ill at home.

Propensity.—Negativistic, automatic obedience, waxy flexibility, withdrawn, expressing fear of death and losing her baby, threatened suicide.

No diagnosed psychiatric disorder in family. Dependent œdema reported prior to delivery. Album negative. B.P. 130/85 at time of hospital admission.

Treatment.—(1) I.C.T. November 1950 to January 1951. 61 days of treatment, 40 hours of coma. (2) Psychotherapy.

Discharged from hospital recovered January 23, 1951.

Psychodynamics.—Father domineering and sadistic, impossible to please, hated by all his children, opposed patient's marriage; patient sensitive, subdued, inarticulate, but meticulous housekeeper. For two years cared for brother's stepson to shield him from the brother who was like his father. This boy showed jealousy at the baby's birth and fantasied that he was more welcome with his parents than with the patient. He began to pay visits to them, and patient's illness was apparently precipitated by her fear of losing him. Husband a self-assured, protective person who stood up to patient's father and brother.

SUMMARY AND INTERPRETATION

The salient features in the symptomatology of the whole group are as follows.

1. Patient lives in pseudo-community of unfriendly, threatening people, has auditory hallucinations and vivid delusions pertaining to death and destruction, of the end of the world; or that husband will leave or patient will die and have her place taken.

2. Patient has guilty fears that her child is abnormal or will die, and often related ideas of multiple delivery.

3. Aggression both verbal and physical is poorly inhibited.

4. There is reinforcement of religious interests to bolster low self-esteem.

5. Self-hatred or hostility is acted out in suicidal attempts or assaults, other preoccupations are acted out in manneristic or stereotyped activity.

6. There are inconstant erotic advances to doctor and sometimes the delusion that the doctor fathered the child.

PERSONALITY FEATURES

Patients in this group are uniformly regarded by their friends and associates as well people, nevertheless on closer inspection their personalities show definite points of vulnerability. In 31 cases sufficient material was available to assess the personality development and adaptation, and a common denominator of personality function was found. In generalizing we can say that our patient is a dependent woman who is deeply challenged by her baby which makes unique demands upon her to give love. More specifically she is a woman who first has not become emancipated from her parents, secondly has a low self-

concept, thirdly needs an excessive amount of love herself and fourthly has a naïve trust in accepted persons in, authority to the point of gullibility. There are several variations shown in the above stated attributes:

(a) *She is not emancipated.*—The family is over-protective, patient is "the baby of the family". There is a special subordinate relationship to one parent—either "daddy's little girl" or "mother's helper". Ambivalent reaction is shown to rejecting, over-critical parent, whose approval is still sought. No warm relationship to either parent is enjoyed. She is the chosen one of the family through whom parents hope to achieve status or success vicariously.

(b) *She has a low self-concept.*—Compensation is shown by display, over-concern with clothes, "being a lady". There is great concern with "what people will think"; concern with "face". There is perfectionism in social and moral virtues to justify own existence, *e.g.*, immaculate housekeeping, prudishness. Patient is deeply threatened by sexual guilt.

(c) *She has an excessive need for love.*—Continuing demands are made for interest and affection from parents. Substitute parents are sought, *e.g.* big sister, husband years older. There is ready expression of jealousy towards husband in any other loyalties or interests he does.

(d) *She shows naïve acceptance of authority* (see below).

Precipitants.—Over-eager parents "take over". Guilt feelings which may be (a) remote; anxiety over masturbation and questioning child's normality; (b) immediate: illegitimacy. Husband fails to be responsible and dependable; he is usually an immature man accustomed to leaning on his wife. The child is rejected. Fears are awakened by some reminder of the threatening, religious authority which patient invests in the Bible or the Church. Fatigue, hæmorrhage, toxæmia, accentuate inadequacy, sap effort.

Prognosis.—Of the 31 patients in the series having a single postpartum psychosis 20 made a good recovery. They had satisfactory insight and were free of symptoms six months after discharge to our direct knowledge. One has since had an acute schizophrenic illness following "influenza" which remitted in four months and she is now symptom free. Ten made a social recovery and are regarded by their families as well though psychiatrically some degree of impairment continues.

Two of the three women with multiple psychoses recovered and the other is listed as a social recovery. One patient died from complications of insulin coma treatment. None remain in hospital. During the same 7½ year period two patients were admitted after a toxic pregnancy with renal failure in addition to their psychosis. One of these patients died within a week of admission of pelvic inflammation and septicæmia, the second recovered from her psychosis spontaneously while her nephritis was responding to medical management.

Discussion

Smalldon's[1] full analysis based on 220 cases, covering 17 years, 1922-1938, in which Zilboorg's earlier work is discussed, will not be considered in detail here for time and space limitations.

At the time of onset many of our cases appeared to be uncomplicated affective disorders and in 14 cases where E.S.T. was available in the community it was given. The improvement obtained was not lasting. The empirical use of E.S.T. in these instances resulting in improvement of symptoms and then relapse is regarded as additional evidence that the disorder is to be classified as schizo-affective. The other evidence is to be found in the symptomatology and the characteristics of the intrapsychic life.

Illegitimacy was a factor in only two of our patients, one woman had a similar personality vulnerability to that described for the group, and for her it seems fair to say that her illegitimate child was a reminder of her guilt in the sphere of sexual behaviour. This guilt was subjectively equivalent in other patients to that aroused by childhood masturbation though in the latter patients there was a characteristic anxiety that the child would be abnormal. In the second case the social history is incomplete in regard to family relationships as the recorder's knowledge of illegitimacy pervaded and dominated the history taking. This woman became ill postpartum after each of three illegitimate pregnancies. Kasanin in discussing Smalldon's paper reports a low incidence of psychotic reactions in unmarried mothers.

One case was excluded from consideration because her illness though similar to that described above followed a miscarriage.

Another woman who had a history of two admissions for manic depressive psychosis underwent a termination of pregnancy and steriliza-

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tion by her family physician to forestall another psychotic episode. She was admitted in a depressed state three months after these procedures and gave a history of three months' illness.

In regard to the sex of the child, girls predominated and in two instances were specifically rejected by the mother because of their sex. Linn and Polatin[3] report the usual finding of a predominance of males which is psychoanalytically interpreted by Zilboorg.

It is not obtainable from our records how many women with previous attacks of psychotic illness suffered an acute psychotic episode of the puerperium during the period under study. Three are recalled from memory, two of them being social recoveries after treatment and one chronically ill and remaining in hospital.

SUMMARY

Hospital admission records at the Crease Clinic and Provincial Mental Hospital, Essondale, have been scrutinized over a period of 7½ years for psychosis occurring for the first time postpartum. All patients concerned were regarded as mentally well by their families up until delivery. The psychotic reaction manifested in this particular group can be classified as schizo-affective psychosis. There was only one delivered by Cæsarean section. The symptoms exhibited in varying degrees by all these women have been described and interpreted. A common pattern of personality vulnerability has been discovered and some precipitating factors suggested. The illness was lengthy but the prognosis good. Attention is drawn to the bibliography for further elaboration of this subject and for a more complete list of references.

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A STUDY OF DEPARTMENTAL IN-PATIENTS*

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IN NOVEMBER, 1951, the author published a paper[1] dealing with an analysis of a census of in-patients, Department of Veterans' Affairs, taken at midnight, March 31, 1950. Comparisons were made with an analysis of all discharges and deaths for the fiscal year ending March 31, 1950. It was apparent that a study of discharges and deaths alone gave a grossly inadequate picture of the Departmental work load. The analysis of the census resulted in information of such value to the Department that the procedure has now been adopted as a routine measure. The value of this information will, of course, increase with the years when a sufficient number of analyses are available to permit of comparisons in the establishing of trends.

Districts across Canada were again requested to submit nominal rolls of all in-patients on

TABLE I.

TOTAL IN-PATIENTS BY AGE GROUPS CENSUS 1950-51

Age	Census 1950	Census 1951
−20	46	72
20–24	316	252
25–29	1,188	931
30–34	932	971
35–39	602	577
40–44	445	379
45–49	455	394
50–54	1,066	949
55–59	1,215	1,262
60–64	1,211	1,275
65–69	1,163	1,228
70–74	900	1,070
75–79	551	660
80+	342	445
Not stated	59	6
Totals	10,491	10,471

*From the Department of Veterans' Affairs, Ottawa, Ont.

TABLE II.

IN-PATIENTS BY AGE GROUPS CENSUS 1951

Age	Total in-patients	Departmental hospitals	Non-departmental hospitals
−20	72	69	3
20–24	252	236	16
25–29	931	718	213
30–34	971	716	255
35–39	577	450	127
40–44	379	300	79
45–49	394	343	51
50–54	949	731	218
55–59	1,262	974	288
60–64	1,275	1,072	203
65–69	1,228	1,042	186
70–74	1,070	963	107
75–79	660	619	41
80+	445	419	26
Not stated	6	3	3
Totals	10,471	8,655	1,816

strength as at midnight March 31, 1951. Nominal rolls of patients both in Departmental and other hospitals were required. As in the previous year, these nominal rolls contained the age of the patient and the principal condition requiring hospitalization (the onus of selecting the principal condition was again placed on the clinical staff). In addition the length of stay of each patient in hospital at March 31 was requested. Nominal rolls were processed at head office,
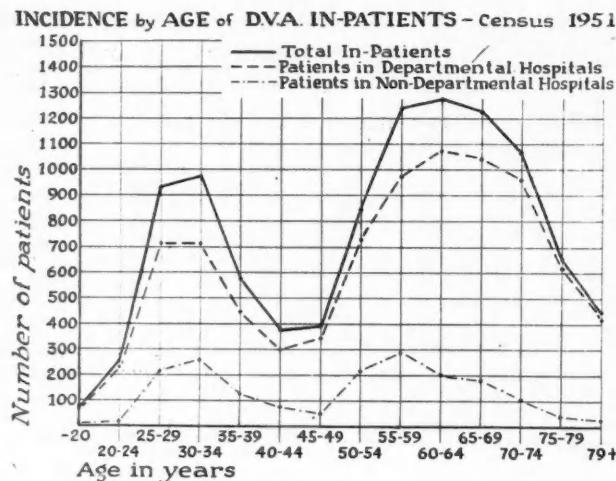
the median age 57 (55 in 1950). In six cases the age was not stated. The largest numbers, 1,275 or 12.2%, were in the 60 to 64 age groups. Over 20% were 70 years of age or over; 4.5% were over 80; only 30% were under 45.

Table I is a comparison of the 1950-1951 census and shows the number of cases by five-year groups for the two years. The increase in the older age groups is apparent.

Table II shows the number of cases by five-

INCIDENCE by AGE of D.V.A. IN-PATIENTS – Census 1951

Fig. 1

COMPARISON of CENSUS 1950 and 1951 by DISEASE GROUPS
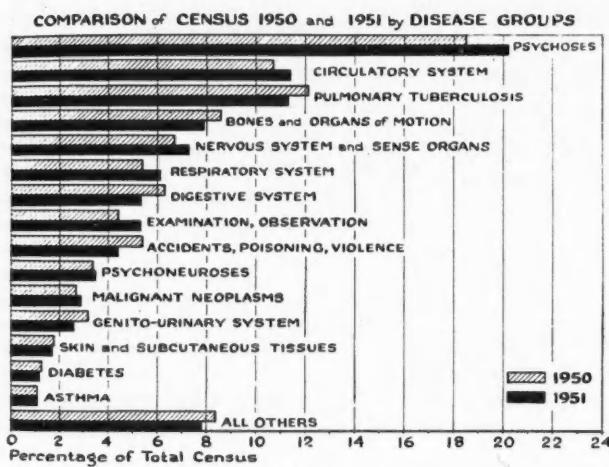
Fig. 2

TABLE III.

Diagnosis	1950		1951		±	Number
	Cases	% total	Cases	% total		
Psychoses..................................	1,939	18.5	2,133	20.2	+	194
Pulmonary tuberculosis....................	1,264	12.1	1,188	11.3	—	76
Diseases circulatory system...............	1,120	10.7	1,189	11.4	+	69
Diseases bones and organs of movement..........	905	8.6	823	7.9	—	82
Diseases of nervous system and sense organs......	697	6.7	762	7.3	+	65
Diseases of digestive system....................	661	6.3	557	5.3	—	104
Diseases of respiratory system.................	570	5.4	635	6.1	+	65
Accidents, poisoning and violence...............	570	5.4	462	4.4	—	108
Examination, observation, domiciliary care.......	460	4.4	554	5.3	+	94
Psychoneurosis................................	357	3.4	365	3.5	+	8
G.U. system...................................	337	3.2	268	2.6	—	69
Malignant neoplasms...........................	281	2.7	298	2.9	+	17
Diseases of skin and cellular tissues.............	190	1.8	180	1.7	—	10
Diabetes......................................	141	1.3	120	1.2	—	21
Asthma.......................................	116	1.1	117	1.1	+	1
All others.	883	8.4	820	7.8	—	63
Totals.................................	10,491	100.0	10,471	100.0	—	20

where coding was done according to the International Statistical Classification of Diseases, Injuries and Causes of Death, 1948.

On March 31, 1951, districts across Canada reported a total of 10,471 in-patients on Departmental strength. The figure for March 31, 1950 was 10,491, a difference of only 20 between the two years. Of the total census, 8,655 or 82.7% were in Departmental institutions; in 1950, 84.5% of the census was in Departmental institutions. The patients ranged in age from 10 to 98 years, the average was 54 (52 in 1950),

year age groups in Departmental and Contract hospitals. The comparatively larger numbers in Departmental hospitals in the younger age groups are accounted for by members of the Armed Forces hospitalized at the request of the Department of National Defence. When considering the older age groups, the majority again are in Departmental hospitals. It is of interest to note that over 1,000 patients or nearly 10% of the total, are over 75 years of age. The above figures are shown graphically in Fig. 1.

Table III is a comparison, by selected diag-

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nostic groups between the two years under review. Psychoses, pulmonary tuberculosis and diseases of the circulatory system occupy the three top places numerically and together account for 42.9% of the total census. Psychoses again occur in first place making up 20.2% of the total census and showing a numerical increase of 194 cases over the previous year. There is a decrease in pulmonary tuberculosis of 76 cases and an increase in diseases of the circulatory system of 69 cases.

TABLE IV.

AVERAGE STAY BY AGE GROUPS
CENSUS 1951

Age	Departmental	Contract	All
–20	86 days	160	89
20–24	115	770	157
25–29	309	486	349
30–34	375	756	475
35–39	378	718	453
40–44	295	632	365
45–49	299	421	314
50–54	1,080	1,735	1,231
55–59	1,551	1,941	1,640
60–64	1,103	2,605	1,342
65–69	796	3,178	1,157
70–74	754	1,934	872
75–79	641	2,509	757
80+	625	994	647
General	760	1,586	904

LENGTH of STAY in hospital by AGE GROUPS
D.V.A. Census 1951
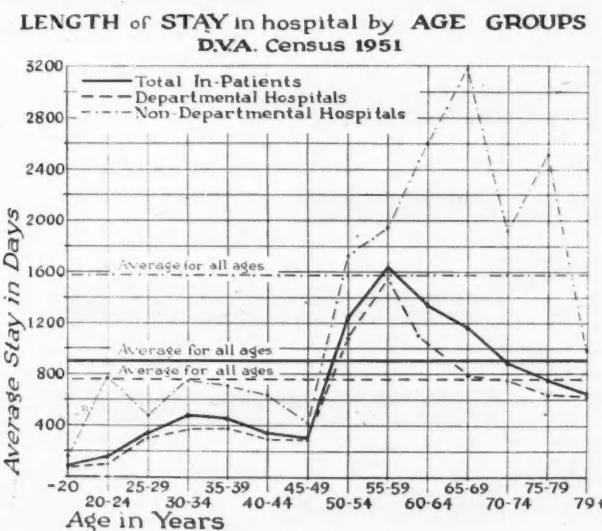
Fig. 3

Fig. 2 is a graphic representation showing a comparison of both years by percentage of the total census broken down under arbitrary disease groups. A study of this figure readily reveals increases or decreases in these selected groups.

When the stay is considered in relation to age, it is found that the stay increased with age to the 30 to 34 age group, there is then a drop to age 49 followed by a sharp rise, the longest stay being in the 55 to 59 age group after which the

stay falls. It should be noted that the largest numbers are in the 50 to 70 year age groups. Figures for the total census, Departmental and Contract hospitals, appear in Table IV.

Fig. 3 is a graphic representation of these figures. When considering the total census the influence of age on stay is apparent regardless of the type of hospital in which the veteran is hospitalized. Curves for both Departmental and Contract hospitals are roughly parallel. The longer stay in Contract hospitals in the older age groups is due to the large proportion of patients in mental institutions many of whom have been there since World War I.

Table V shows the average stay by age groups for certain selected disease groups. The influence of age on stay is quite apparent. This is true for most conditions studied, for example, in the Psychoses the stay exceeds the general average at

TABLE V.

AVERAGE STAY BY AGE GROUPS
SELECTED DISEASE GROUPS—CENSUS 1951

Age	Psycho-neurosis	Diseases respiratory system	Hernia	Diseases circulatory system	Diseases digestive system
–20	66	14	—	—	22
20–24	34	17	17	17	16
25–29	134	23	64	81	36
30–34	67	44	19	61	34
35–39	29	115	45	34	50
40–44	190	44	—	31	55
45–49	113	30	11	38	101
50–54	637	100	196	106	85
55–59	831	130	140	189	94
60–64	639	243	192	306	132
65–69	1,082	217	337	369	243
70–74	841	263	746	442	399
75–79	316	426	27	564	596
80+	5,520	411	1,073	597	346

age 50, rises to a peak at 60 and again falls below the average at 79. Patients with pulmonary tuberculosis are less influenced by age but there is a gradual rise to age 45 with a peak at 60. The stay in arthritis and rheumatism is variable but again the influence of age is felt with a sharp rise in stay at 65, increasing to a peak at 80.

A study of the census of in-patients at yearly intervals reveals valuable information regarding the type of case hospitalized and the length of time such cases remain in hospital. The longer the period over which such studies are continued, the more valuable the information obtained will be.

SUMMARY

1. An analysis of a census of in-patients, Department of Veterans' Affairs, taken at midnight, March 31, 1951, is presented. Comparisons are

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made with a similar analysis on the census taken at March 31, 1950.

2. The average and median age have both increased two years.

3. There has been an increase in the number of psychotic patients who form the highest single group and account for 20.2% of the total census at March 31, 1951.

4. Data presented show that hospital stay increases markedly with the age of the patient. This increase in stay with age is apparent whether the patient is in a Departmental or Contract hospital. It is also apparent when individual disease groups are studied.

5. A yearly census of in-patients at a fixed date provides valuable information not available from other sources.

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THE FREQUENCY, PATHOGENESIS AND SIGNIFICANCE OF INTIMAL HÆMORRHAGE°

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INTIMAL HÆMORRHAGES have been described in atherosclerotic arteries by numerous authors. The phenomenon has been described in the coronary arteries,[1,2] in the pulmonary arteries,[3] the cerebral arteries,[4,5] the carotid and renal arteries[6] and in the femoral arteries.[7,8,9]

In each instance with the exception of the work by Lindbom,[9] the number of arteries has been small so that the impression is given that intimal hæmorrhage is uncommon. Because each series has described intimal hæmorrhage in association with thrombosis, the fact that the majority of such hæmorrhages are unrelated to thrombosis has been somewhat overlooked. Lindbom[9] studied intimal hæmorrhage in the femoral and popliteal arteries in 55 selected autopsies, these being either cases of coronary thrombosis or recent thrombosis of the lower limb arteries. Thus Lindbom's work gives little idea of the frequency of intimal hæmorrhage as it occurs in the routine autopsy.

In Wartman's series of intimal hæmorrhage in the lower limb,[8] only 3 cases were reviewed, these all being cases associated with thrombosis.

No study has been made of the incidence of intimal hæmorrhage in a large number of routine autopsies, and it is one of the purposes of this paper to deal with this aspect.

The pathogenesis of intimal hæmorrhages has only been partly explained and their significance has been considered almost entirely from a viewpoint of thrombosis.

MATERIAL AND METHODS

The femoral and popliteal arteries which had been previously removed and fixed in 10% formalin in a study of 152 routine autopsies at the Montreal General Hospital[10] were reviewed with particular regard to intimal hæmorrhage. The arteries of both limbs were cross-sectioned throughout their lengths at 3 to 4 mm. intervals and examined for hæmorrhages of the intima. Only clear-cut recent hæmorrhages were included in the series, these standing out promi-


NUMBER OF INTIMAL HEMORRHAGES
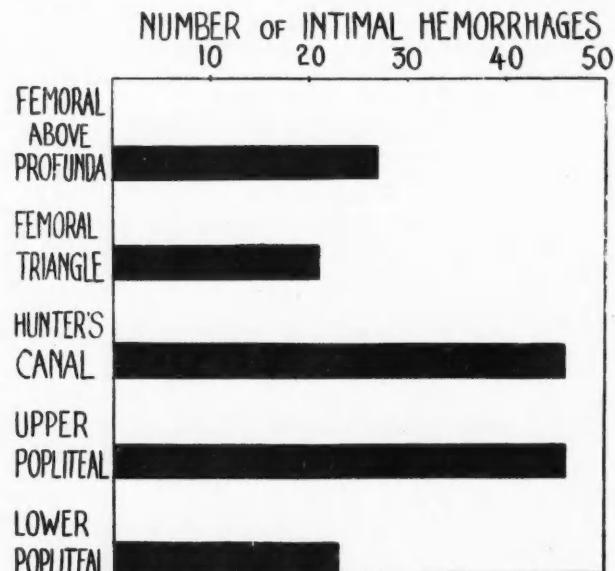
Fig. 1.—Illustrating the incidence of intimal hæmorrhage in the various segments of the femoral and popliteal arteries.

nently as dark brown areas lying in the intima deep to the arterial endothelium. In addition histologic preparations were made of the last 23 hæmorrhages in the series and stained with phosphotungstic acid hæmatoxylin with a view to noting the association of intimal capillaries with hæmorrhage. The sites and number of hæmorrhages were recorded and plotted in diagrammatic form (Fig. 1). Because the

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femoral artery above its profunda branch was not removed in 61 lower limbs in the original series,[10] correction was made for the relative incidence of intimal hæmorrhage in this segment of the total 304 arteries. However this correction is made only in the diagrammatical representation of intimal hæmorrhage in the various portions of the arteries and the numbers to be reported below refer to cases and hæmorrhages actually observed.

Finally the case histories of the entire series of 152 autopsies were studied to determine if there were clinical features peculiar to this group of cases.

RESULTS

Of the 152 routine cases studied, intimal hæmorrhage was observed in 55. In these 55 cases a total of 157 hæmorrhages was observed, the hæmorrhages often being multiple in the same case. Fig. 1 demonstrates the incidence in the various segments of the artery. This incidence corresponds to the incidence of atherosclerotic plaques in these arteries.[10]

The average age of those cases having intimal hæmorrhage at death was 65, the average age of the remaining cases was 56. There were 101 males in the total series and 51 females. The sex distribution in those exhibiting intimal hæmorrhage was 44 males and 11 females. Thus intimal hæmorrhage was about twice as common in males as in females.

Brachial blood pressures recorded for the group having intimal hæmorrhage ranged from 240/160 to 110/58, the average being 176/99. For the group without intimal hæmorrhage, the range was from 270/160 to 110/60, the average being 154/88.*

In the 152 cases examined, some degree of atherosclerosis was noted in the femoral and popliteal arteries in 123. Of these 123 cases, intimal hæmorrhage occurred in 55, an incidence of just under 45%. Intimal hæmorrhage was noted to be restricted to the atherosclerotic group.

DISCUSSION

Incidence.—From the study made it is seen that intimal hæmorrhage is an extremely common finding in atherosclerosis as seen at autopsy. The fact that the femoral and popliteal arteries of both sides were studied in this series made it

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*Only those blood pressures recorded prior to terminal events were employed in the series.

possible to observe a relatively long stretch of artery. For this reason the incidence of intimal hæmorrhage in this series is probably higher than might be expected in a comparable study of the relatively shorter coronary arteries.

Pathogenesis. — Intimal hæmorrhages have been considered to result from rupture of intimal capillaries in most instances, but Lindbom[9] noted that the intima was "fragile" and that in a few cases the endothelium had ruptured and a dissecting hæmatoma was present in continuity with the arterial lumen.

The origin of intimal capillaries has been studied in some detail. Robertson[11] pointed out the correlation between the vasa vasorum and the localization of arterial disease. Paterson[1] was unable to find capillaries in the intima of children or in the intima of normal adult coronary arteries, but found they were common in association with atherosclerosis. By serial section of coronary arteries Paterson was able to demonstrate that in 4 of 9 arteries studied, the capillaries in the intima had their origin from the main arterial lumen. Leary[12] described intimal capillaries arising directly from the lumen of coronary arteries but also noted capillaries passing into the intima from the vasa vasorum.

Gross, Epstein and Kugel[13] reported penetration of the media by the vasa vasorum to supply the intima in well marked atherosclerosis. Of the 23 intimal hæmorrhages studied in this series by histologic section, intimal capillaries were observed in 15. These were single sections, however, and serial section might have revealed a higher incidence of this association. In any case, there is a striking correlation between intimal capillaries and intimal hæmorrhage. It was noted that these capillaries were usually ectatic, a finding in agreement with the description of Paterson.[1]

Just why capillaries develop in the intima is obscure but there has been some speculation. This has included the following two ideas:

(1) In response to the demands for nutrition by the plaques.[1, 14] (2) In secondary relation to partial thrombosis.[1]

When the actual factors precipitating intimal hæmorrhage are considered, various suggestions have been made. Paterson[1] pointed out that because some of the capillaries arise directly from the main arterial lumen, they are exposed to arterial pressure. When systemic hypertension is present, this capillary pressure is correspondingly elevated. He felt that variation in the

strength of the capillary wall probably plays little part in the cause of bleeding into the intima of coronary arteries. According to Paterson, the most important factor in preserving the continuity of the intimal capillary is the rigidity of the supporting stroma. He observed that intimal hæmorrhages when recent, had occurred almost without exception into softened plaques. This softening, he concluded, allowed the capillary to dilate as a result of the pressure within its lumen.

In contrast to this idea, Horn and Finklestein[14] noted that softening of a plaque tended to occur when its rapidly increasing size outstripped its capillary blood supply. Leary[12] observed that areas of plaques adjacent to intimal capillaries tended to be spared from the softening process. Thus softening and capillaries may be somewhat mutually exclusive. As will be outlined below, the strength of the intimal capillary cannot be disregarded. In cases of intimal hæmorrhage it is difficult to see how previous softening can be distinguished from the inevitable disruption of the plaque caused by the hæmorrhage. As fluids and solids are to all intents and purposes equally incompressible, it is not likely that in a closed system such as the atherosclerotic plaque, the physical state of the plaque constituents would significantly affect the mechanical support of the intimal capillary.

In this present series there were two definite cases of intimal hæmorrhage in patients suffering from a hæmorrhagic diathesis. In the vast majority of cases, however, no such factor could be invoked to explain the hæmorrhages. It is therefore apparent that some properties of the capillaries of the atherosclerotic plaque are responsible. A well known disease where defective capillaries alone are to blame for hæmorrhages is scurvy. This point is raised because one of the oldest theories of the pathogenesis of atherosclerosis postulates a fundamental disturbance in the ground substance of the arterial intima. Virchow, and later Aschoff[15] demonstrates that the earliest lesion of atherosclerosis was a deposit of stainable lipids in the ground substance of the arterial intima. They believed that as a result of mechanical stress the nature of the ground substance was in some way altered so that it imbibed more of the plasma constituents, among them cholesterol. In 1935 Duff[16] again drew attention to the ground substance and noted its fundamental importance in the pathogenesis of atherosclerosis.

Following up these ideas, I am at present engaged in a study of the arteries of scorbutic guinea pigs. By this method a specific and controlled injury of the ground substance[17] which is known to respond to mechanical stress[18, 19] may be produced in the artery. The results, as yet incomplete and to be reported subsequently, indicate that stainable lipids are deposited in the ground substance of the aortic intima of scorbutic guinea pigs within 16 days from the onset of a scorbutic diet without cholesterol feeding. By 24 days the intima is well loaded with lipids deposited in the ground substance and macrophages have made their appearance. There is no lipid deposit in the reticulo-endothelial system as represented by the spleen. In chronic scurvy large nodular fibrous proliferations project into the lumen from the arterial intima.

If one assumes that the ground substance is fundamentally at fault in atherosclerosis, some interesting comparisons may be made between atherosclerosis and scurvy, not the least important of which have to do with intimal hæmorrhage.

In scurvy there is a tendency to proliferation of thin-walled ectatic capillaries in various parts of the body.[19, 20] A similar type of capillary develops in atherosclerotic plaques. Just as the capillaries in scurvy are notoriously prone to rupture, so the capillaries of the intima in atherosclerosis frequently rupture, as has been demonstrated in this series. Thrombosis is common in scurvy.[21]

Besides the disturbance in inter-cellular cement which is postulated to occur in atherosclerosis, ageing itself is associated with increased capillary fragility. Cutter and Marguardt[22] noted an increase in fragility of the capillary walls in direct proportion to the age of the patient.

Having considered some of the factors which influence the strength of the capillary wall, it is appropriate to review the physical principles controlling the mechanical stress exerted on this wall. Recently Burton has demonstrated the applicability of Laplace's law to blood vessels.[23] Briefly, for a straight segment of vessel the law may be expressed by the equation: $T = P \times R$, (where T = the tension in dynes per cm., R = the radius in cm. and P = the excess hydrostatic pressure inside over outside the vessel in dynes per cm.^{2}).

"Tension" refers to the circumferential stretching of the vessel wall resulting from the excess

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pressure within it. It may be considered as the force required to hold in apposition the edges of a 1 cm. slit made longitudinally in the vessel wall. When tension exceeds the strength of the vessel wall, rupture occurs. A glance at the equation shows that tension is increased when radius is increased and when hydrostatic pressure is increased. Thus it is seen that the ectatic capillaries of atherosclerosis and of scurvy are subjected to particularly high tension simply because of their large radius. When there is co-existent arterial hypertension, the tension is further increased as Paterson has suggested.

When all these factors are considered it is little wonder that intimal hæmorrhage is so frequent in atherosclerosis.

Significance of intimal hæmorrhage.—The importance of intimal hæmorrhage as a factor precipitating thrombosis has rightly received much attention.[1, 2, 7, 9, 14] In the present series there were 18 instances of old thrombosis and no clear-cut case of recent thrombosis. The question as to whether hæmorrhage had been responsible for the cases of old thrombosis was not investigated because only recent hæmorrhages were studied. In the two instances of doubtful recent thrombosis, no intimal hæmorrhage was noted.

Besides this important aspect of intimal hæmorrhage, it has been pointed out[9] that because of the size of the hæmatomas they proportionately enlarge the plaques in which they occur. Wartman[2] described 6 cases of complete occlusion of the coronary artery simply by the magnitude of the hæmatoma. Lindbom did not observe this phenomenon in his study of the lower limb arteries, nor was it seen in the present series. This may be explained by the fact that the femoral and popliteal arteries are very considerably larger than the coronary vessels.

Injury to arteries in experimental animals has long been known to be followed by sclerotic lesions at the site of injury.[24, 25, 26] In man, Duff has suggested a counterpart in the intimal injury associated with luetic aortitis which is known to predispose to atherosclerosis at the site involved.[16] It is not, therefore, a foreign idea that injury resulting from hæmorrhage should further add to the arteriosclerotic process.

The significance of intimal hæmorrhage apart from being a precipitating factor in arterial thrombosis or a direct cause of arterial occlusion would be small if intimal hæmorrhage was a terminal event only. However the fact that old hæmorrhages are observed and that nests of hæmosiderin have been demonstrated in atherosclerotic plaques[12] makes it apparent that such hæmorrhages occur repeatedly in arteries affected by atherosclerosis.

SUMMARY

152 routine autopsies at the Montreal General Hospital were studied with regard to intimal hæmorrhage in the femoral and popliteal arteries. Intimal hæmorrhage was found exclusively in association with atherosclerosis and a total of 157 hæmorrhages occured in 55 of a total of 123 cases exhibiting atherosclerosis. The distribution of hæmorrhages tended to coincide with the distribution of atherosclerosis. Old age and hypertension tended to be associated with intimal hæmorrhage. It was commoner in males than in females.

In a discussion of the pathogenesis of these hæmorrhages it was postulated that atherosclerosis is fundamentally a disturbance of the ground substance of the arterial intima. The striking similarity between scurvy, as an example of ground substance disease, and atherosclerosis was pointed out and intimal hæmorrhages were cited as being one of these similarities. The physical principles governing rupture of vessels as outlined by Burton were reviewed and the importance of intra-capillary hypertension and the radius of the capillaries was demonstrated. The idea was presented that the inter-endothelial cement of intimal capillaries is defective, thus weakening the wall and facilitating rupture.

The significance of intimal hæmorrhage as a precipitating factor in thrombosis and as a factor causing arterial occlusion by resulting hæmatoma was again repeated. The part played by intimal hæmorrhage in enlarging the atherosclerotic plaque and in propagating the atherosclerotic process through a mechanism of injury was suggested. Finally it was demonstrated that these hæmorrhages occur throughout the life time of the atherosclerotic plaque and are not simply a terminal event.

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RADIATION INJURY OF THE KIDNEY*

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THE OLDER LITRERATURE contains a few reports of nephritis in man following radiation of the kidney for renal neoplasm,[6] but nothing has been recently published regarding the pathological histology seen in the kidneys associated with modern fractional methods used in the routine therapy of inoperable extra-renal neoplasms.[2] In a recent paper Kunkler et al.[13] have described a clinical syndrome associated with kidney damage due to radiation of malignant testicular tumours, and have emphasized the limit of renal tolerance to x-rays. This author has established a figure of 2,400 r as the dose which when given homogeneously to both kidneys will cause renal failure. The kidney is in that group of organs which has been considered in the past as radio-resistant and it was felt that dosage in excess of 5,000 r was necessary to cause gross shrinkage of the organ.[1]

The histopathology of the experimental lesion produced in animals following radiation of the kidney region consists primarily of marked tubular destruction with interstitial fibrosis and to a lesser extent patchy glomerular hyalinization.[3, 4, 8] Kidneys transplanted beneath the skin of the loin and heavily irradiated show similar changes.[11] These lesions in the experimental animals are thought to be analogous to the lesions in the material presented here:

CASE REPORT

The patient, a 40 year old white female, was well until approximately six years before her death when she first noticed a lump in her right breast. This was biopsied

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and a pathology report of scirrhous carcinoma of breast was made. The patient returned to hospital for a radical excision and subsequently reported at regular intervals for intensive radiation therapy. A total of over 11,000 r was administered over the right chest and axilla during a period of five years. Nine months after her right radical mastectomy a number of lumps appeared in the left breast and this was removed by a simple mastectomy.
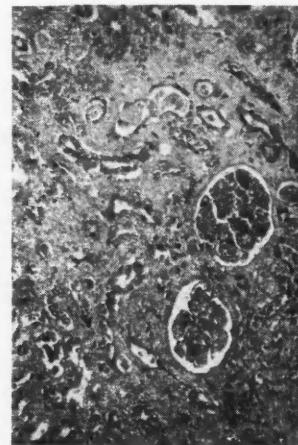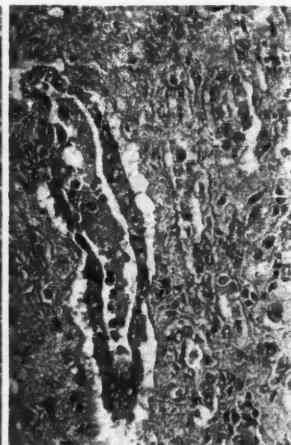

Fig. 1.   Fig. 2

Fig. 1.—Kidney cortex showing tubular degeneration. H.P.S. X260. Fig. 2.—Kidney cortex showing marked diffuse interstitial fibrosis. H.P.S. X110.
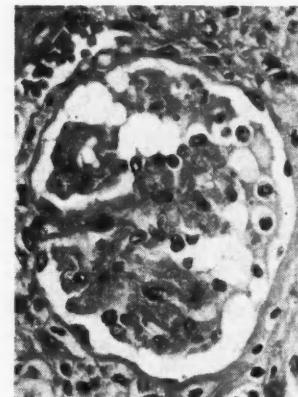

Fig. 3   Fig. 4

Fig. 3.—Glomerulus showing cells and protein in Bowman's space, with patchy hyalinization of the tufts and adhesions between the tuft and capsule. H.P.S. X300. Fig. 4.—Glomerulus showing thickening of basement membranes and patchy hyalinization of the tuft. P.A.S. X280.

The microscopic examination revealed only a chronic interstitial mastitis in the left breast.

The patient remained well for three years and then began to complain of progressively severe backache which was proved to be associated with secondary tumour deposits in the lumbar spine. This complication was treated with analgesics, a plaster body cast, and many series of fractionated deep x-ray therapy. The

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total skin dose administered to the lumbar spine was in excess of 11,000 r, given fractionally over a period of 4 years, 8 months. Using isodose curves it was calculated that a 4,700 r tumour dose would be concomitantly received by the kidneys.

In spite of this treatment the patient gradually deteriorated, became markedly anæmic and was finally bedridden, when she developed pathological fractures of both femurs. Supportive measures, including blood transfusions and analgesics were continued until her death which occurred the day following what appeared to be a cerebral accident.

At autopsy the gross and microscopic findings were in keeping with the clinical impression. Metastases were found in the lungs, liver, peritoneum, pleura, meninges, thyroid, adrenals, and bone marrow of the spine and femurs. The kidneys only will be described in detail.

The kidneys were small, the right weighing 75 gm. and the left 100 gm. The capsule stripped readily to reveal a smooth, tense surface which was blotchy, varying in colour from tan to purple. The cut surface was not remarkable except for some accentuation of the markings at the cortico-medullary junction. The urinary pelves and ureters were not dilated and were lined by smooth pale mucosa. The urinary bladder was thin-walled and the epithelial lining was smooth and cream-coloured. No tumour metastases were present in either kidney.
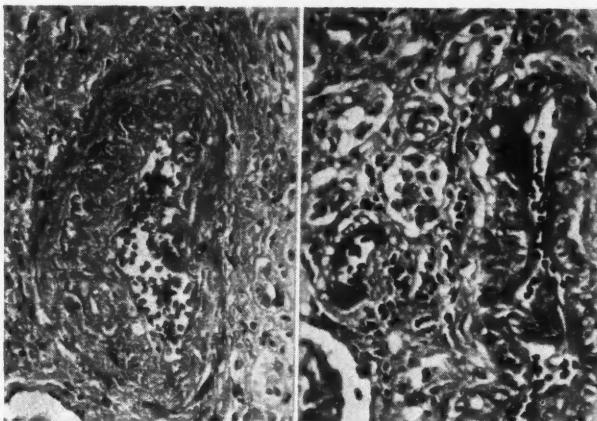
Fig. 5   Fig. 6

Fig. 5.—Medium sized and small artery showing marked fibrinoid degeneration in the intima. H.P.S. X280. Fig. 6. —Medium sized and small artery showing marked fibrinoid degeneration in the intima. H.P.S. X280.

Sections from both kidneys were cut at 5 microns and stained with hæmatoxylin and eosin, hæmatoxylin phloxine and saffron, Masson's trichrome stain, and periodic acid Schiff's reagent.

A striking finding common to all sections was marked tubular damage ranging from mild cloudy swelling and hydropic degeneration to necrosis with pyknotic and karyorrhexic nuclei (Fig. 1). There was a diffuse, fine hyalinizing fibrosis of the interstitium throughout the cortical tissue (Fig. 2). Many of the remaining tubules which were widely separated were dilated. The tubular damage was pronounced in the proximal portions of the nephron. For the most part the glomeruli did not appear to be badly damaged, although a few showed splitting and thickening of capillary and capsular basement membranes, with patchy hyalinization in an occasional tuft (Figs. 3 and 4).

A prominent feature was a fairly pronounced subendothelial proliferation of fibrous connective tissue in the walls of the medium-sized and small arteries (Fig. 5). The majority of vascular changes appeared old, with thickening and hyalinization of the intima and narrowing of the lumen. A few medium sized vessels showed more acute injury with degeneration of the collagen in the intima and rarely thrombosis of the vessel (Fig. 6).

COMMENT

With the advent of atomic warfare, new impetus has been given to the morphological examination of tissues from man and animals which have been exposed to ionizing radiation.[9, 10] For the most part the lesions produced in man as a result of atomic warfare, and in animals exposed since at the various test detonations, have been caused by a single extremely large dose of radiation. The lesions resultant from this massive exposure were found to be a triad composed of hæmorrhage, necrosis and secondary infection with involvement of nearly every organ and tissue in the body.[10] The kidneys of animals exposed at the Bikini detonation and in others given a large dose from a conventional x-ray source consisted of hæmorrhage beneath the mucosa of the kidney pelves, and in severe cases, petechiæ in the cortical parenchyma. These kidneys appeared grossly not unlike the "flea-bitten" kidneys of focal glomerulonephritis.[9] Microscopically, however, the chief lesions were degenerative changes in the proximal and distal convoluted tubules together with occasional areas of focal necrosis and hæmorrhage. The glomeruli and arterioles appeared normal. The only other finding of note was a focal infiltration of the interstitium at the cortico medullary junction by large mononuclear cells.

The microscopic lesions described in the kidneys following a simple massive exposure indicate that the primary lesion is chiefly tubular and it would appear that this portion of the nephron is more radiosensitive than the glomerular tissue.[7, 8, 9] Although the lesion described in the present case appears chronic with scarring of the interstitium as a marked feature, it is seen that the proximal and distal convoluted tubules appear to be the chief site of destruction. In this respect the lesion is similar to hydronephrosis in the relatively early stage.[12, 14] Grossly, however, in this lesion which we are ascribing to radiation injury no hydronephrosis or pyelonephritic streaking was present, and a tumour dose of radiation of 4,700 r had been received by the kidneys.

In the experience of one of the authors (J.D.H.) in the early stages, radiation injury produces a fibrinoid type of arterial degeneration seen principally in the subendothelial connective tissue. This goes on to endothelial proliferation and also proliferation of subendothelial connective tissue. One often finds, even years

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after radiation therapy, hyaline material in the wall of the vessel (Fig. 6). This stains bright red with Masson's stain and it is quite characteristic of radiation injury. As a complication of the endarteritis produced by radiation, there may be, in the early stages, thrombosis, while in the later stages the progressive narrowing of the lumen due to fibrosis may lead to ischæmia and scarring, such as has been described in the kidneys in this case.

SUMMARY

A renal lesion consisting of marked tubular degeneration, vascular injury and interstitial scarring with slight glomerular hyalinization is presented as an example of chronic radiation injury in one of the deeply seated so-called radioresistant organs. The picture is similar to that seen in early hydronephrosis but in the case presented there was no evidence of obstruction anywhere in the urinary tract and no dilatation of the ureters or pelves. The irradiation was carried out in the course of therapy for secondary malignancy of the spine and the total tumour dose was 4,700 r in the kidney region. It should be stressed that heavy irradiation of the abdomen or spine in the region of the kidneys may do irreparable damage to renal structure and function.

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CUTANEOUS AND SYSTEMIC NORTH AMERICAN BLASTOMYCOSIS

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THE PROGNOSIS in North American blastomycosis is good when the disease remains clinically confined to the skin, in contrast to disseminated blastomycosis which is almost uniformly fatal. We are reporting two illustrative cases.

Starrs and Klotz, in a recent review of systemic cases in Canada,[1] outline their criteria for an unequivocal diagnosis. They found only two cases to meet these requirements. Drummond et al.[3] and Aszkanazy et al.,[4] have each reported another case, confirmed by culture.

CASE 1

In July, 1949, a 75 year old retired farmer of Neepawa, Manitoba, who had never been out of the Province, observed a painless persistent discharging "stye" on the left upper eyelid. No history of trauma was noted. Simultaneously, painless crusted ulcers appeared on the skin of the right arm, left thigh and left great toe. A tentative diagnosis of carcinoma was made and the patient was referred for investigation and therapy.

On admission to the Winnipeg General Hospital, September 21, 1949, all ulcerations were similar. None showed any evidence of healing. The floor of each ulcer was covered by an adherent yellow crust. The border was irregular, purple and elevated, surrounded by a zone of erythema up to 1 cm. in width, and the base moderately indurated. The lesion on the left upper eyelid measured 0.6 cm. in diameter; on the lateral aspect of the right arm, 1.5 x 0.5 cm.; on the inner surface of the left thigh, 2 cm.; and on the dorsum of the left great toe, 2 cm. in diameter. No other pertinent symptoms or signs were elicited. A clinical diagnosis of cutaneous blastomycosis was made by Dr. M. R. MacCharles.

Laboratory Findings.—Hæmoglobin: 11.9 gm. per 100 ml., erythrocytes: 3.7 million per c.mm.; leucocytes: 4,000 per c.mm., with normal differential, E.S.R. (Westergren): 63 mm. per hr. A roentgenogram of the chest was reported as essentially normal.

The lesions on the right arm and left leg were excised on September 22, 1949. A biopsy was also taken from the left eyelid. Histologic examination revealed all lesions to be similar. Marked pseudo-epitheliomatous hyperplasia with intraepidermal abscesses were the predominant features. Dermal abscesses, and tubercles containing chronic inflammatory, epithelioid and giant cells were also present. Within the abscesses and tubercles (some within giant cells) were seen single-budding spherical bodies having a double contour, measuring from 8 to 16 microns in diameter. These findings were reported as consistent with blastomycosis, the final diagnosis to await culture report.

A portion of the tissue removed at operation was examined directly and by culture for tubercle bacilli, fungi and pyogenic organisms. Moist cover slip preparations showed the same budding forms as the tissue. Ziehl-Neelsen stains were negative for acid-alcohol fast organisms. No tubercle bacilli or fungi were recovered on culture. Staphylococcus pyogenes was isolated.

The lesions continued to discharge a small amount of purulent exudate. Roentgen therapy was directed to the left eyelid and the left great toe. Penicillin by injection and streptomycin compresses were applied. At the time of discharge on October 12, 1949, the lesions on the right arm and left leg had healed. There was still a small amount of discharge from the lesions on the eyelid and toe.

The patient was re-admitted to the Winnipeg General Hospital on January 12, 1950, with a crusted ulcer

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involving the left upper and lower eyelid, measuring 3 x 1 cm. No change was seen in the lesion on the great toe.

The exudate from the eyelid lesion showed the same budding cells as before. Cultures on blood agar at 37° C. developed wrinkled, waxy, slow-growing colonies composed of budding cells only. On Sabouraud's maltose agar the colony was white and cottony. Microscopic preparations showed septate hyphæ with lateral round to oval conidia. This was reported as *Blastomyces dermatitidis*. Intradermal tests were done on January 29, 1950. These were positive to blastomycin, histoplasmin and tuberculin. The two lesions were excised and skin grafted successfully and the patient was discharged from hospital on February 18.

On July 23, 1951, a fissured lesion was excised from the dorsum of the left great toe, at Neepawa and submitted to Dr. J. M. Lederman for examination. The lesion had been present for three months and was located at the same site as the original one. The same histological features were present, and it was reported as cutaneous blastomycosis. The patient's general condition has remained good.

CASE 2

This patient was a 68 year old retired railway engineer of Rivers, Manitoba. In February, 1951, he had an attack of generalized aching and weakness, with transient cough and pink-tinged sputum, regarded as "flu". While convalescing, a persistent "cold sore" appeared at the right angle of his mouth. Subsequently in March a puffy swelling developed over the lateral aspect of the right ankle, with painful nocturnal throbbing. Several ounces of thick yellow foul pus were released by incision. However, relief was transient and a thin discharge continued. Slight dyspnœa on exertion was first noted by the patient at this time.

On admission to the Brandon General Hospital on April 22, 1951, the two lesions were seen. The wound on the right ankle measured 1.5 cm. in diameter with gaping verrucose margins and a central sinus extending down to bone. An ulcer, 2.5 x 1.5 cm. at the mucocutaneous junction occupied the right angle of the mouth. Its margins were elevated and irregular, the floor crusted, granular and soft. The provisional diagnoses were tuberculous osteitis of talus and epithelioma of the lip.

Laboratory findings.—Hæmoglobin: 6.5%, erythrocytes: 3.4 million, leucocytes: 9,900, E.S.R. (Westergren): 52 mm. per hr. Roentgenogram of right ankle and foot showed some rarefaction of the talus, deep to the sinus.

On April 30, 1951, the ankle sinus was curetted, soft sequestra removed, and the lip ulcer excised by Dr. H. S. Evans. The lip was sutured, the sinus packed with vaseline gauze and the leg and foot put up in a plaster cast.

The histologic features of both lesions were similar, showing pseudo-epitheliomatous hyperplasia with intraepithelial micro-abscesses; tubercles and abscesses in the dermis contained single-budding refractile bodies with target nuclei, ranging from 8 to 15 microns in diameter. A diagnosis of blastomycosis was made. The disease was considered to be systemic, and radiographic examination of the chest was advised.

The plaster cast was soon removed because of fetid odour. Moist cover slip preparations of the serous sinus discharge showed morphologic *Blastomyces dermatitidis* on two successive examinations. Although there was no sputum, samples from voluntary coughing showed no fungi on direct preparation and culture. Multiple cultures of the exudate for fungi and tubercle bacilli were negative; *Staph. pyogenes* was recovered. No blood cultures were made.

Skin tests on May 26, 1951, with blastomycin, histoplasmin, tuberculin and coccidioidin were all negative. Serum for complement-fixation test, sent to Dr. N. F. Conant, Duke University, North Carolina, was reported negative for blastomycosis.

Only a few scattered crepitations were heard in the chest and no large or widespread lesions were anticipated. However, an x-ray on May 2, 1951, showed a dense "snowstorm" infiltration of both lungs. When the diagnosis was established, increasing doses of potassium iodide were begun, reaching 175 minims of saturated aqueous solution daily.

The lip soon healed by primary union, but the ankle sinus remained open and discharging. On May 24 a scaly lesion, 5 mm. in diameter, with an erythematous border was seen over the 3rd lumbar vertebral spine. This persisted until death. Slow partial closure of the ankle sinus followed irrigation with Dakin's solution. Meanwhile, dyspnœa had steadily increased and on June 4, 1951, moderate hæmoptysis occurred. An x-ray of the chest on June 6, 1951, showed no improvement. On the same day urinary incontinence and burning pain on micturition began. Centrifuged urine showed 200 erythrocytes and 15 leucocytes per high power field. No fungi were seen. After discharge at his own request on June 28, the patient died at home on August 8, 1951. Permission for autopsy could not be obtained.
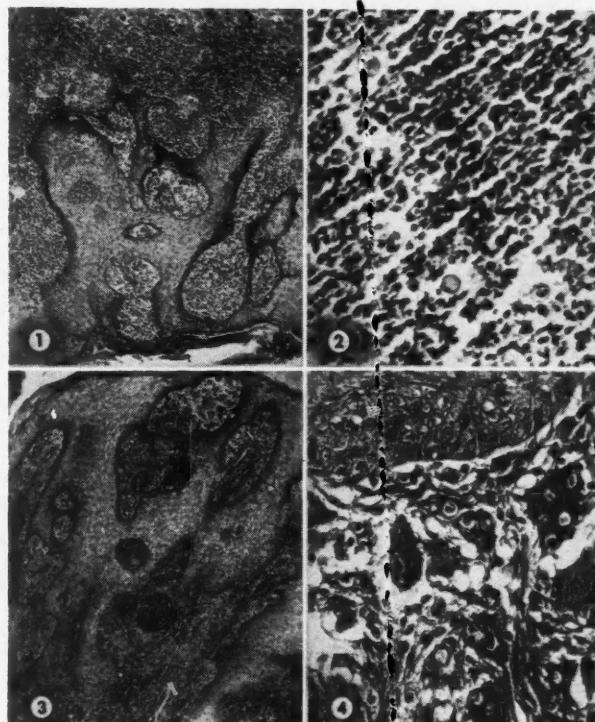

Fig. 1. (Case 1)—Pseudo-epitheliomatous hyperplasia; dermal tubercles and abscesses. x 50.
Fig. 2. (Case 1)—Double contoured Blastomyces cells. x 500.
Fig. 3. (Case 2)—Pseudo-epitheliomatous hyperplasia with intra-epithelial micro-abscesses. x 50.
Fig. 4. (Case 2)—Double contoured, single budding cells, some within giant cells. x 400.

DISCUSSION

In Case 2, pulmonary infiltration was typically asymptomatic until far advanced, even when cutaneous and osseous dissemination had occurred. It has been proposed recently[8] that most cases of clinically cutaneous blastomycosis are metastatic lesions from an unsuspected primary infection, usually pulmonary, which may remain dormant over many years.

In Case 1, the simultaneous appearance of multiple cutaneous lesions on protected, as well

as unprotected parts, suggested secondary origin, although there was apparently no pulmonary involvement two months later. In the subsequent two and one-half years the patient's general condition remained good. Clinical systemic blastomycosis rarely develops in patients with skin lesions of long duration.[7, 9] It is likely, though not proved, that *Blastomyces dermatitidis* occurs in nature but the usual reservoir of infection is unknown.

The laboratory procedures used in blastomycosis include examination of tissue sections and cover slip preparations of exudate or scrapings, culture, skin tests, and the complement-fixation reaction.

The diagnosis can be established on hematoxylin and eosin stained sections, or moist cover slip preparations.[5, 6] Reduction of light accentuates the highly refractile unstained double contoured cell wall of the organisms. The results of attempted staining of the cell wall with iron hematoxylin gave no clearer preparations in our cases. The importance of actually measuring the diameter of the *Blastomyces* with an eyepiece micrometer cannot be stressed too strongly, since most other fungi, having a tissue yeast phase, can be excluded on their size.

The viable and formalin fixed cells of *Blastomyces dermatitidis* measure 8 to 16 microns in diameter and multiply by single-budding. The centre is basophilic and tends to shrink from the cell wall in fixed tissue. On a few occasions micro-forms measuring 2 to 5 microns have been described in association with the larger organisms, but cultural proof of identity is lacking.[8] They were not seen in our cases. *Candida albicans* measures 2 to 4 microns; *Histoplasma capsulatum* 1 to 5 microns. *Cryptococcus neoformans* measures 5 to 20 microns and can be distinguished by a wide refractile gelatinous capsule, best demonstrated by India ink preparations of scrapings from the tissue. *Blastomyces brasiliensis* measures 10 to 60 microns in diameter and is identified by the larger cells, showing multiple-budding. *Sporotrichum Schenckii* is rarely found in tissue or in exudates; it is cigar-shaped and measures 3 to 5 microns in length. *Coccidioides immitis* measures 20 to 80 microns in diameter and is filled with numerous endospores 2 to 5 microns in diameter.

The histologic reaction in blastomycosis is not specific, but is sufficiently characteristic to stimulate a careful search for the organisms in multiple sections of the tissue. If it were considered in the differential diagnosis of all granulomatous lesions, blastomycosis would be found more often.

When examination of the sections reveals the histological reaction and the typical bodies of *Blastomyces dermatitidis*, isolation should be attempted on more tissue or exudate. Confirmatory identification is based on the growth of the yeast phase on blood agar at 37° C. and the filamentous phase on Sabouraud's glucose agar at room temperature. The addition of antibiotics to the media aids in eliminating contaminating bacteria.

The skin test and complement-fixation reaction are primarily prognostic and therapeutic guides; used as diagnostic aids they may be misleading. When the disease has been proved to be widespread, the prognosis is universally fatal; if the extent of the disease is not definitely known, these procedures may be of use in determining the prognosis. A negative complement-fixation reaction with a positive skin test indicates a good prognosis; the disease will remain localized to the skin or one organ. A positive complement-fixation reaction with a positive skin test denotes a fairly good prognosis; the disease usually remains limited to the skin or one organ. With a positive complement-fixation reaction and a negative skin test, the prognosis is poor and the disease is usually disseminated. Negative results with both tests is an uncommon combination; the prognosis varies, both fatalities and cures have followed. Conant[7] advises that patients with a positive skin test should be desensitized with a vaccine prior to potassium iodide therapy. The vaccine is not easily available in Canada and its use is controversial. Cross reactions between histoplasmin and blastomycin are relatively common with positive intradermal tests. A considerable proportion of the apparently healthy population of the United States show skin sensitivity to histoplasmin but very few show reaction to blastomycin.

SUMMARY

A case of cutaneous and one of systemic blastomycosis are reported from Manitoba; the diagnostic measures are discussed.

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NON-SPECIFIC ULCER OF THE LARGE BOWEL*

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SINCE CRUVEILHIER first described a "simple" ulcer of the cæcum in 1830, relatively few reports of solitary non-specific ulcers of the large bowel have appeared. They have been described variously as simple penetrating ulcer of the cæcum,[1] simple non-specific ulcer of the cæcum,[2] and simple ulcers of the cæcum, colon and rectum.[3] Although the disease is apparently uncommon, it has undoubtedly masqueraded under

his normal bowel habit. He presented with marked tenderness in the right lower quadrant, a temperature of 100.2° and a leucocyte count of 11,000. Appendicitis was diagnosed and that same day, December 7, 1951, the abdomen was opened through a McBurney incision. The appendix appeared normal, but the posterior wall of the cæcum felt indurated and was fixed to the posterior abdominal wall. The abdomen was closed, and one week later a barium enema demonstrated a small ulcer of the ascending colon close to the ileocæcal valve (Fig. 1). A diagnosis of carcinoma of the cæcum was made and on December 20, 1951, a right hemicolectomy was done. It was noted at operation that the area of induration had diminished in size.

On opening the bowel the lesion proved to be a shallow crater-like ulcer situated on the posterior wall of the ascending colon 2 cm. above the ileo-cæcal valve. It measured 1.5 x 0.8 cm. in diameter, and the margin was regular, slightly raised and indurated, and appeared darkly red. Microscopically (Fig. 2) there was no sign of malignancy and no evidence that the ulcer

Fig. 1   Fig. 2

Fig. 1.—Barium enema showing ulcer of ascending colon near ileocæcal valve. Fig. 2.— Section showing margin of ulcer. Clump of exudate on right. (Low power).

the diagnosis of diverticulitis of the cæcum, perityphilitis, or idiopathic perforation of the cæcum. As the diagnosis has rarely been made before operation, and the complications may be fatal, it is important that surgeons be aware of this entity.

Our interest was aroused after examining a specimen removed by right hemicolectomy for a lesion of the lower ascending colon thought to be carcinoma. The patient was a fifty year old man who one year previously had developed a duodenal ulcer proved by a barium meal. Three weeks before admission, he began having crampy lower abdominal pain. On the day before admission the pain settled in the right lower quadrant. There was no associated nausea or vomiting, and no disturbance of

had developed from a diverticulum. The ulcer extended to the tunica muscularis, the floor being covered with purulent exudate and necrotic tissue, and the underlying muscle was infiltrated with lymphocytes, polymorphs, plasma cells, and a few eosinophiles. The adjacent submucosa was œdematous.

On subsequent investigation of the patient, there was no evidence of typhoid, paratyphoid, amœbiasis, dysentery or syphilis.

The patient was re-admitted three weeks following discharge with lower abdominal pain and mild diarrhœa which subsided in a few days. A plain film of the abdomen showed two flecks of barium from the previous enema, in the region of the sigmoid colon, which may have been evidence of diverticula.

A search of the Hamilton General Hospital records of the past fifteen years uncovered only one other possible case. This was a sixty-five

year old man with a long history of duodenal ulcer, who was admitted in 1946 complaining of severe lower abdominal pain. Laparotomy the same day disclosed an acute perforation of the cæcum, without any evidence of large bowel obstruction or foreign body. The perforation was oversewn and a temporary ileostomy done. This case was very similar to many reported cases of acute perforation of non-specific ulcers of the cæcum.

Two months later he was again admitted with a pelvic mass and large bowel obstruction necessitating a colostomy. A barium enema through the colostomy did not demonstrate any diverticula and the patient died one year later of undetermined cause.

Two other cases which were operated upon with a diagnosis of acute appendicitis, and which presented lesions of the cæcum at operation very similar to findings in cases of non-specific ulcer, were proved pathologically to be inflamed diverticula of the cæcum.

Pathology.—Non-specific ulceration may occur anywhere in the gastro-intestinal tract from the mouth to the rectum. In the large bowel, the ulcer is usually solitary, although more than one may be present simultaneously. In 1941 Barlow[3] collected 78 cases from the literature. Almost 50% were situated in the cæcum or lower ascending colon, and 16% in the sigmoid colon. He pointed out the histological similarity between these ulcers and those occurring in the stomach and duodenum.

In Barron's collected series[4] of 53 cases in 1928, the ages ranged from 18 to 80 years, with an average of 41 years. The ulcers were twice as common in males as in females. Coincident ulceration of stomach and duodenum has been reported in 4% of cases, and was present in our case.

The ulcers vary from a few millimetres to several centimetres in width, and from superficial erosions to those which perforate the bowel. They may be round or oval, and are usually darkly red. The margin which is often smooth and regular is slightly raised and indurated, except in the most acute lesions. Externally, the bowel may appear dark or gangrenous in acute cases, or thick and indurated in the subacute and chronic ones.

The microscopic picture also varies from acute ulceration which may extend through all layers, with polymorphonuclear infiltration, œdema,

hæmorrhage and necrosis, to chronic ulceration with reactive fibroplasia. In the healing stage, cicatrization may lead to bowel obstruction.

Etiology.—The etiology is unknown. As with peptic ulcers, numerous theories including chemical, neurogenic, vascular, infective and mechanical have been proposed. Ectopic gastric mucosa has never been described here. The fact that the majority occur near the ileocæcal valve is probably significant. Many of the patients have suffered from chronic constipation. A pathologically similar disease, called "chronic ulcerative cæcitis" occurring in rats, has been extensively investigated[5] but the pathogenesis remains obscure.

Diagnosis.—The symptoms and signs vary, depending on whether the ulcer is acute, subacute, or chronic, with or without mass formation. The acute cases usually give a short history of pain in the right lower quadrant of the abdomen which sometimes follows epigastric pain, and which may or may not be accompanied by nausea and vomiting. Tenderness is localized to the area of the ulcer, and there may be muscular rigidity and rebound tenderness. Mild fever and leucocytosis are frequently present. The commonest complication is perforation of the cæcum. If acute intraperitoneal perforation occurs, signs of peritonitis will be present and free air could probably be demonstrated radiologically in the peritoneal cavity. If the perforation occurs posteriorly and extraperitoneally, an abscess will develop which may spread towards the pelvis or kidney, or may point superficially. Subphrenic abscess following perforation has been reported.

In subacute and chronic cases, a tender mass may be palpable, usually in the right lower quadrant, or the patient may present symptoms of small or large bowel obstruction due either to cicatricial contraction, or adhesions. Hæmorrhage per rectum is a rare sign. Blum[6] reported a case of ileo-colic intussusception in an adult in which there was a chronic ulcer in the lower part of the ascending colon.

The diagnosis is rarely made before operation or examination of the resected specimen. Even if a cæcal ulcer is demonstrated radiologically as in our case, the diagnosis cannot be made with certainty.

In the acute stage, the preoperative diagnosis is usually appendicitis, although occasionally cholecystitis, perforated peptic ulcer, or right

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ureteral colic may be simulated. At operation, a local area of the colon may be acutely inflamed or gangrenous, with or without perforation, and an ulcer crater may be palpable through the bowel wall. In the slowly penetrating form with perityphilitis, a mass may be indistinguishable from carcinoma. The lesion may be confused with diverticulitis, as in the two cases mentioned above, regional enteritis, hyperplastic tuberculosis, dysentery, amœbiasis, or perforation by a foreign body.

Treatment.—When an obviously acute ulcer of the cæcum or colon is encountered at laparotomy, the lesion may be either excised locally and the bowel closed, or the ulcerated area may be oversewn and reinforced with omentum, depending on the extent of the process and the friability of the bowel. In acute perforation, the opening should be oversewn and protected by a piece of detached omentum, and the area drained. If closure is impossible, the perforation may be exteriorized to form a cæcostomy or colostomy. It is questionable whether a bowel resection should subsequently be performed. In any event, a barium enema should be done as a follow-up. A localized abscess must be drained, and further treatment will depend in part on whether or not a fæcal fistula persists. Obstructed cases require appropriate measures for relief of the obstruction primarily. If an indurated area in the bowel is indistinguishable from carcinoma, the bowel must be resected. It is probably better to re-operate after the bowel has been cleansed, and prepared by chemotherapy and antibiotics.

CONCLUSIONS

1. Solitary non-specific ulcer of the large bowel is an uncommon lesion of unknown etiology, involving the cæcum or lower ascending colon in approximately 50% of cases.

2. The usual preoperative diagnosis is appendicitis.

3. The commonest complication is perforation of the cæcum, and in the past the mortality rate in these cases has been high.

4. The ulcer may be indistinguishable clinically from carcinoma.

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COCCIDIOIDOMYCOSIS[*]

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INFECTION with the fungus *Coccidioides immitis* Rixf. and Gilchr. is endemic in the warm arid regions of the southwestern United States, the Chaco of Uruguay and Argentine and probably northern Mexico, but a rare, sporadic case has been reported elsewhere, *e.g.* Italy and Hawaii.[1] It is the most pathogenic of the fungi, being dangerous to work with in the laboratory, indeed the only case recorded in Britain was a laboratory infection.[2] Jacobsen[3] (1930) mentions Canada at the end of a list of States of the Union and countries where cases have been reported. He does not, however, give the source of the latter information and no Canadian case is listed in the survey of 182 reported cases published the previous year.[4] We have not been able to find records of a case reported from Canada although cases are recorded in Illinois of people who never visited endemic areas. Kurtz and Loud[5] report four cases in New England all of whom had spent a variable period of time in recognized endemic areas. It is our purpose in this communication to record infection with this organism in a man who had never been out of Nova Scotia except to Europe for service in World War I.

In the tissues *C. immitis* is seen in characteristic form as a large spherule (20 to 80 microns) with a doubly refractile wall filled with endospores (Figs. 1 and 2). The fungus spreads by rupture of the spherule wall and release of the endospores which may be carried by the blood or lymph stream to distant regions. We have found that the free endospores in tissue sections can easily be differentiated from small pyknotic lymphocytes by the Hotchkiss-McManus stain which colours the endospore wall red. Intermediate stages of maturation from endospore to spherule are also seen in the tissues.[1] While the characteristic spherule is taken as pathognomonic for the diagnosis in man, for complete identifica-

tion the recognition of other characteristics in laboratory culture is necessary since a closely related parasite has been isolated from rodents—*Haplosporangium parvum*.[6] This parasite has not been so far identified in human infection.

Infection is usually manifest as an acute, benign and self-limiting respiratory infection ("Valley fever", "San Joaquin fever", "desert fever") which may be accompanied by allergic symptoms, particularly erythema and muscular and joint pain ("desert rheumatism"). Occasionally the lung lesion may progress to cavity formation and still be self-limiting. The skin may also, in rare instances, be the primary portal of entry. From either source, progressive and usually fatal disease, coccidiodal granuloma, may develop. Since the primary site of infection may

initial symptoms lasting six months or more of much pain and incapacity of joints with but little swelling.

CLINICAL HISTORY

The patient, a man aged 61, had been well all his life apart from childhood diseases. He had only been out of Nova Scotia once, during 1915-1918, while serving in the United Kingdom, France and Belgium in the First World War. Since that time he had obtained his livelihood at casual labour which included work handling imported fruit including fruit from California. The patient was too ill to give us further detail.

His present illness began acutely in July, 1949, when he developed a dull pain in the back of his head and at the base of the skull. In the course of a few days the pain spread to involve other parts particularly the left shoulder and arm, and paræsthesia of the left leg, necessitating stopping work. With the pain he noticed weakness of the involved extremities. At the time of hospitalization, one month after the onset, the right arm and leg were also involved.
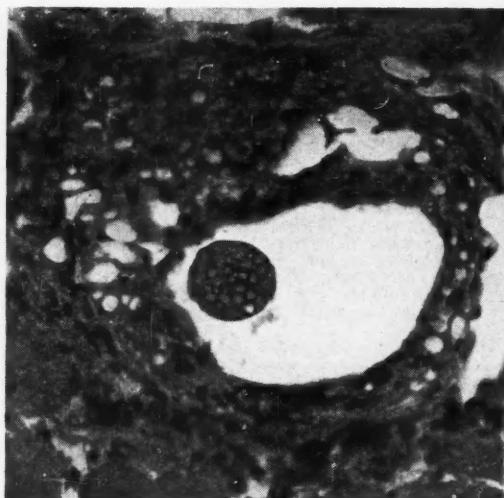
Fig. 1.

Fig. 2.

Fig. 1.—Granuloma in skeletal muscle; the characteristic spherule filled with endospores is seen in the central cyst. X150. Fig. 2.—Higher magnification of spherule of Fig 1, surrounded by foamy macrophages. X550.
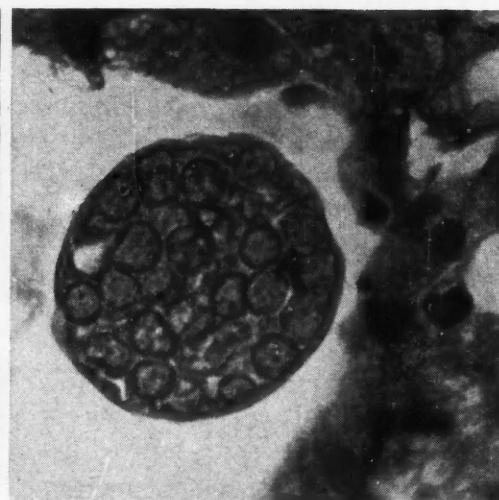
be inconspicuous and even heal, the progressive disease may take many forms, according to the mode of spread. The case we record is of progressive form but is unusual, if not unique, in that it was characterized clinically by muscular pain, spasm, wasting and weakness which all the more emphasizes the opinion of Smith[1] that "mycotic infections occur with sufficient frequency to justify their consideration in the differential diagnosis of every difficult and complicated pulmonary and systemic infection". In addition, in our experience, we would state that they should receive special consideration in reference to the sudden development in adults of pain and swelling in joints, fleeting and flitting, and likely to be labelled as "rheumatism". In three proved fatal cases of pulmonary moniliasis encountered by us, the patients all had

Gross weakness of the arms and legs was noticed on admission as well as absence of the abdominal and cremasteric reflexes, astereognosis (left), finger-nose inco-ordination and questionable sensory loss to pain over the left shoulder and distally in the right leg. Limb reflexes were present and equal. Apart from an elevated sedimentation rate of 24 mm. fall in 1 hour (W & L), blood examination showed nothing of note. X-ray examination of the chest on admission was negative. Extensive osteoarthritic changes were noted in the cervical spines, causing narrowing of the intervertebral foramina between C_3 and C_4 and C_5 and C_6. A cervical myelogram revealed no filling defect or other abnormality. Cerebrospinal fluid was within normal limits and the Mastic test was normal, but a slight elevation of the cell count was present. The patient continually showed a slight elevation in temperature with occasional episodes of high fever associated with acute urinary and pulmonary symptoms, which subsided on antibiotic therapy.

The course of the disease was steadily progressive with much pain, muscular weakness and atrophy with severe muscular spasms in the early stages. During this phase he also had bouts of diarrhœa and vomiting. Early in the period of hospitalization neck traction was applied without benefit, similarly there was no benefit from a course of radiation to the cervical spines. During the terminal 6 months the patient had had little pain but he

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remained a helpless invalid unable to move his left arm or legs and only feebly able to move the right arm. In May 1951 a biopsy was taken of the left deltoid muscle. This revealed a granulomatous condition associated with the characteristic parasitic stage of *C. immitis* which will later be discussed under the autopsy findings.

A coccidioidin skin test was done in June 1951 using 0.1 ml. of 1:100 dilution of the antigen intradermally. This remained negative after 24, 36 and 48 hours. Such results are encountered in widespread systemic infection. He became very emaciated and expired in August 1951, with the clinical and laboratory picture of an overwhelming pyogenic infection and uræmia.

Summary of Autopsy

Gross emaciation; gross wasting and patchy fibrosis of muscles of limbs, chest, abdomen and shoulder girdles; scattered throughout all lobes of both lungs numerous abscesses often with central liquefaction, from miliary to 1.5 mm. in diameter; gross pyelonephritis with large abscesses in both kidneys, cystitis; slight splenomegaly; small scattered early softenings in brain; all other organs showed wasting only.

Histology

The renal substance was practically destroyed by acute abscesses in which a variety of bacteria were identified. It was evident that, secondary to a cystitis associated with the indwelling catheter, gross pyelonephritis had developed and that there was a terminal pyæmia, since the lung and cerebral lesions were all acute necrotizing abscesses in which there was no evidence of a granulomatous process, and in which prolonged search with special stains has not revealed fungi. Outside of muscle, only a few chronic granulomatous lesions were recognized. Those were all in the kidneys and in one a disintegrating spherule was identified.

Sections of numerous muscles from the limbs, chest and abdominal wall showed atrophy, fibrosis and patchy recent necrosis. There was a fairly generalized interstitial round cell infiltration and numerous small granulomata consisting mainly of foamy phagocytes and giant cells. Sometimes the phagocytes were orientated round spaces which contained typical spherules (sporangia) pathognomonic of *C. immitis* (Figs. 1 and 2) (with the reservation already stated). These spherules were very brittle and were generally dislodged in the cutting of the paraffin blocks so that they were found outside the cysts. In addition in some areas there were numerous free endospores and occasional larger yeast-like bodies intermediate between endospores and spherules.

At the autopsy it could hardly have been appreciated that the lung lesions were all terminal and that the fungus was almost exclusively confined to muscle. Unfortunately only the lungs were retained for culture. Both were retained intact. One was preserved in formalin. The other was frozen for culture. Both were serially sliced without revealing a primary focus. All standard media for the culture of fungi were utilized on the frozen lung, as well as cupric sulphate media stated to be specific for *C. immitis*. All media failed to produce growth of fungi and intratesticular guinea pig inoculation was negative.

Discussion

While the organism was not identified by culture the appearance in the tissues is so characteristic that one must assume that the pathogen was *Coccidioides immitis* or a closely related fungus; the organism was probably imported rather than of local origin and the history of working with imported fruit is suggestive.

It was obvious from sections that the sporangia rupture and liberate endospores. Since lesions were present in the muscles of all limbs spread must have been by the blood stream. The failure to find specific granulomata outside muscle except for small resolving foci in the kidney must indicate that endospores lodging in other organs had been successfully phagocytosed and the infecting organism must have been of a strain which found the environment of muscle a specially favourable soil. Since the only significant portal of entry is the respiratory tract one must assume that the primary lung lesion was minimal and its identification made even more difficult by the numerous terminal lesions. While the localization to muscle is unique in the literature, progressive fungal diseases are protean conditions and the uniqueness is more likely a "breach in the observance" on the part of others.

Summary

A case is described of infection with *Coccidioides immitis* or a closely related fungus. The victim was a male aged 61 who had never been out of Nova Scotia except over twenty years before the infection for military service in Europe. The fungus was almost exclusively confined to muscle where the granulomatous reaction to it led to gross wasting, fibrosis and contracture of the limbs producing a most painful

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and crippling malady. Death was brought about by a terminal pyelonephritis and pyæmia.

We are indebted to Dr. Walter Leslie for his clinical notes, to Dr. C. M. Harlow for the gross findings at autopsy, and to Dr. T. E. Kirk, S.T.M.O., for permission to publish.

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IMMUNIZATIONS IN INFANCY

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IMMUNIZATIONS IN INFANCY has been selected as a subject for this meeting, for the reasons that, as yet, there is no universal agreement as to the age to begin immunization, and there are variations in the choice of immunizing agents.

One finds doctors beginning at the age of one month and one reads in the literature that immunization should be started at three months, five months, and six months; all agree that immunization should be completed for diphtheria, whooping cough, tetanus and smallpox by the first year. In the prospect that we can arrive at a standardized routine, I present this subject hoping that a standard may be established for the whole of Canada because of the movement of peoples from one province to the other. Thus we will know all have been immunized by the first year for these diseases. In the *American Journal of Public Health* (40: 674, 1950) on simultaneous immunization of newborn infants against diphtheria, tetanus and pertussis, production of antibodies and the duration of antitoxin levels, the writer concludes that "in the first year, the capacity to produce antibodies in response to antigenic stimulation definitely increases with advancing age." The results of immunization may not be as good as obtained in the older child but a significant degree of protection may be obtained by starting prophylactic immunization injections in the newborn and it is suggested that triple combined immunization be postponed until three months of age and thus the critical period of immune mechanisms will have been passed.

The American Academy of Pædiatrics has a committee that is constantly reviewing the research and assaying the subject of immunization and therapeutic procedures for all infectious diseases. They publish a booklet every two years keeping the members informed of these accepted procedures and therapy. The 1951 booklet is just printed and many of my statements will be from this book as well as from the Connaught Laboratories Research Department.

DIPHTHERIA, TETANUS AND WHOOPING COUGH

It is practically universal to give immunization for diphtheria, tetanus and pertussis in a combined mixture. However, the choice of material varies. Diphtheria and tetanus toxoids are available in two types: (1) Those containing alum precipitate or aluminum hydroxide. (2) Those not containing these substances; these are called fluid toxoids.

The combined antigens containing alum precipitate or aluminum hydroxide adsorbed diphtheria and tetanus toxoids and *H. pertussis* vaccine are preferred by the American Academy of Pædiatrics Committee and are in use in the majority of the states of the United States. The fluid toxoids of diphtheria and tetanus and *H. pertussis* vaccine are the choice in Canada and some of the States. The reasons are:

The alum precipitate or aluminum hydroxide adsorbed diphtheria and tetanus toxoids with *H. pertussis* vaccines are preferred because: (a) There is a more prolonged antitoxic immunity produced. (b) Greater effectiveness as immunizers against pertussis in early infancy. (c) Less likelihood of producing systemic reactions by reason of lower protein content and slower absorption.

The committee feels these factors far outweigh the two advantages of the non-adsorbed fluid mixtures which undoubtedly all have greater speed in achieving immunizations, and freedom from formation of the occasional sterile abscess.

In giving the combined alum precipitate or aluminum hydroxide adsorbed toxoids attention must be given to the following details:

1. Agent must be injected intramuscularly, (and a small amount of air to follow to wash out the agent), at intervals of not less than one month and preferably not more than three months elapsed between injections.
2. Minimum injections should be three. If dosage has been lowered by reason of reactions, then more injections must be given.
3. Total dosage of *H. pertussis* not less than 40 billion. This dosage is adequate to protect 4 out of 5 infants for

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one year. (Larger dosage should protect even higher percentages).

4. Combined immunization should be commenced at three months of age under ordinary circumstances. However, there are no objections to earlier in the second month of life, but where this is done, the total of the combined antigen must be greater, four injections containing 60 billion *H. pertussis*. The presence of an epidemic of diphtheria or whooping cough is an indication for early immunization.

5. Volume of a single injection should be limited to 0.5 c.c.

6. During the course, the same muscle should not be used twice. If subject has had whooping cough, use only the diphtheria and tetanus toxoid without *H. pertussis*.

Combined immunization with fluid diphtheria and tetanus toxoids containing suspended *H. pertussis* vaccine is given subcutaneously. Reasons for use have been given, namely, rapid immunization as in an epidemic or if individual is going away on short notice, because the entire course may be squeezed into three weeks' time at intervals of ten days. However, intervals of three to four weeks are preferred because they give a better immunity. The minimum age for effective immunization is probably five months of age and the total of *H. pertussis* contained in the three or four injections should be 75 billion. As the Connaught product contains 15 billion per c.c., this would mean five injections. However, the Research Laboratories in answer to this state that giving 45 to 60 billion dosage is not important but the number of injections and the interval of dosage are of greater significance. Three injections at monthly intervals and a fourth, three to six months later equals 60 billion. If you desire to immunize at or before three months, give a reduced dose for the fluid toxoids.

There are contraindications to triple combined immunization: (1) Any respiratory or other acute infection is reason for delaying injections. (2) Prolonged interval between injections even up to six months rarely interferes with final immunity. (3) Presence of cerebral damage in an infant is an indication for delaying immunizing until after one year of age and then use fractional doses. (4) Existence of poliomyelitis in epidemic proportions in a community should be a signal for the reconsideration of injections until the situation is clarified.

In regard to injections and poliomyelitis, there is no doubt that the site of the injection will be involved should the individual contract poliomyelitis whether due to local reaction or contamination, but the argument that because of the injection he becomes more susceptible is debatable, so much so that in Detroit, (I do not know about other places), the pædiatricians have decided against stopping immunization during July to September. They feel that the chances of contracting poliomyelitis are far less than the dangers involved of contracting whooping cough or diphtheria and the effect on the public of stopping immunizing procedures might have a very serious effect on the whole preventive immunization program that has taken years to establish and with such successful results.

Diphtheria has almost disappeared, as well as smallpox, in progressive communities. Therefore, I strongly disapprove of stopping immunization for whooping cough and diphtheria during the poliomyelitis season.

SMALL POX

There is no controversy among medical men regarding vaccination. Therefore, I will not discuss the subject beyond saying that repeat injections every five to seven years seem a wasted effort, but records show immunity sometimes has been lost in three to five years, and as immunity reactions are so trivial it is justifiable.

An infant with eczema or other forms of dermatitis should not be vaccinated for smallpox and siblings of infants with eczema should not be vaccinated because of the danger of cross infection by contact or droplet infection. (Secretions from nasopharynx contain virus on the fourth and fifth day following vaccination.)

SCARLET FEVER

The Committee of the Academy of Pædiatrics previously mentioned has definitely come out against immunization for scarlet fever because they say, due to chemotherapy and antibiotics, scarlet fever is no longer a serious disease and so responsive to these drugs that immunization is no longer advisable.

The Connaught Research Laboratories say: "the significance of biological products derived from hæmolytic streptococci has been greatly reduced by the introduction of chemotherapy and antibiotic agents which are now of first importance". I would agree with this statement with the qualification that it might not be true if extremely toxic scarlet fever made its appearance. We began to think acute rheumatic fever and chorea had disappeared from our locality for some reason or other for the past six or seven years, but the year 1951 saw both again blossom forth in very severe forms.

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The toxin as prepared by the Connaught Laboratories contains the toxin of four different strains of hæmolytiç streptococci and not just the erythrogenic toxin as some have thought.

My experience over the past 25 years in giving scarlet fever toxin immunizations with large groups of children controlled by Dick tests, and recalling virulent scarlet fever before the days of antibiotics, prompts me to continue the immunizations until such time as I am sure we are not just going through a phase of non-virulent type of this disease.

BACILLUS CALMETTE GUERIN (BCG)

Time does not permit us to discuss immunization against tuberculosis but where it is practised the results have proved its value. The lowering death rate is equally good where sanatoria treatment of open cases and finding out the exposures from open cases is effective. One concludes that if unable to carry out a community tuberculosis campaign, with adequate hospitalizations and clinics and social services, it is then necessary to do BCG immunization. Perhaps eventually it will be compulsory for the whole of Canada for newborn infants.

SCHEDULES OF IMMUNIZATION

I will present two schedules, one for alum precipitate or aluminum hydroxide adsorbed diphtheria and tetaus toxoids with *H. pertussis*

vaccine, and one using fluid toxoids of diphtheria tetanus with *H. pertussis* vaccine.

Schedule for alum precipitate or aluminum hydroxide adsorbed diphtheria and tetanus toxoids and 20 billion *H. pertussis* vaccine:—

3 months of age	—0.5 c.c. intramuscular, left gluteus
4th month	—0.5 c.c. intramuscular, right gluteus
5th month	—0.5 c.c. left vastus lateralis
6th month	—vaccination over deltoid
10th to 12th month	—Schick test

Over the age of infancy, deltoids and triceps muscles may be used.

Over 6 years	—preliminary Schick test
Over 10 years	—sensitivity test

Recall injections,

at 1 year	—1 full dose, 0.5 c.c.
at 3 years	—¾ dose, 0.3 c.c.

(every 3 years thereafter—0.3 c.c. (and after any exposure

RECOMMENDED SCHEDULE

Diphtheria, tetanus and whooping cough combined fluid toxoids with *H. pertussis*, 15 billion per c.c.

3 months	—1 c.c. subcutaneous
4 months	—1 c.c. subcutaneous
5 months	—1 c.c. subcutaneous
8 to 12 months	—1 c.c. subcutaneous

Schick test

Vaccination for smallpox during the first year, say at 6th month.

18 months	—Scarlet fever immunizations, followed by —Dick test and boosters if necessary

RECALL DOSES

2nd year	—Diphtheria, tetanus and *H. pertussis*
3rd year	—Diphtheria, tetanus and *H. pertussis*
5th year	—Diphtheria, tetanus and *H. pertussis*
6 to 9 years	—vaccination for smallpox, diphtheria and tetanus toxoid
10 to 14 years	—Schick test before immunizing and reaction test before giving toxoids, or give minimal doses of 0.1 to 0.2 c.c. in previously immunized children.

OPTIC NERVE DEGENERATION IN PERNICIOUS ANÆMIA*

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IT HAS LONG BEEN KNOWN that visual impairment may occur in pernicious anæmia due to retinal hæmorrhages or thrombosis of retinal vessels. It has been less well appreciated that the neurological lesions associated with pernicious anæmia may involve the optic nerves causing progressive visual impairment and ultimately optic atrophy. Benham[1] has recently reviewed the literature and added 5 cases of his own, bringing the reported cases up to 26. This small number of reported cases would seem to be misleading as an indication of the frequency of optic nerve involvement in pernicious anæmia since

Benham was able to discover his 5 cases in a group of 112 patients with subacute combined degeneration. From the scanty attention the subject has received in the literature it may be inferred that in the past there has been a failure to recognize that this manifestation may be a prominent and often early feature of the disease.

Since the consequences to the patient of wrong diagnosis with delay in instituting treatment may be permanent impairment of vision it was thought worthwhile to report the following 4 cases illustrating the association of involvement of the optic nerves and pernicious anæmia. Case 1 recently came under our observation at Sunnybrook Military Hospital and Cases 2, 3 and 4 were found in the records at the Toronto General Hospital.

CASE 1

Mr. W.T. This previously healthy 62 year old retired farmer experienced blurring of vision when reading in

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November, 1950. About the same time he developed anorexia and sensations of fullness in the abdomen which lasted until February, 1951, and then disappeared without treatment. He consulted an optometrist about the blurred vision and glasses were prescribed without benefit.

On April 25, he was admitted to the Eye Service at Sunnybrook Hospital where he stated that the blurred vision had become progressively worse until 3 weeks before but that it had been stationary since that time. For several months he had suffered pains behind the

A diagnosis of toxic amblyopia was made but a neurological consultation was requested because of the pains in the head. It was learned from the patient that he had experienced numbness and tingling of the fingers and toes since March, 1951. He had lost about 5 pounds in weight in 3 months, in spite of a good appetite, and had suffered increasing fatigue.

Examination showed rather poor nutrition. The tongue was clean and smooth at the edges. The liver and spleen were not enlarged. Blood pressure was 174/110. No abnormality was detected in the heart. Apart from
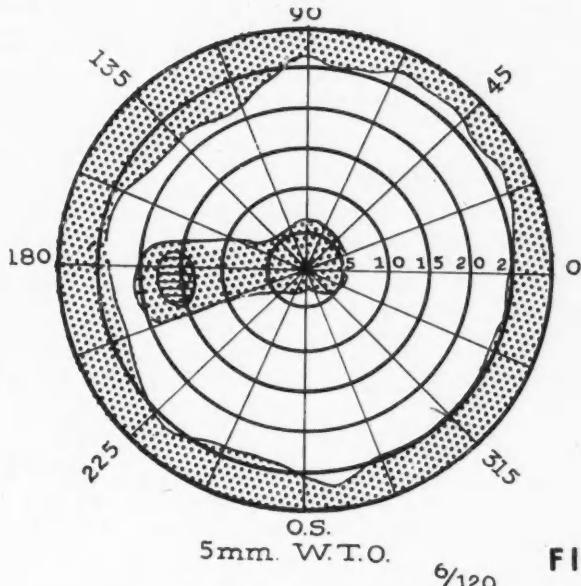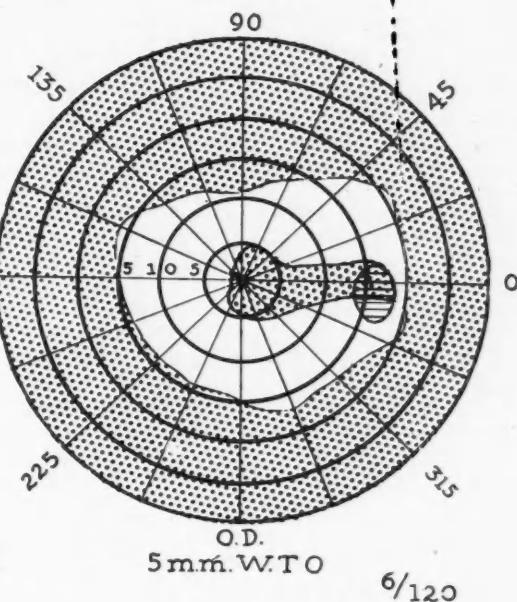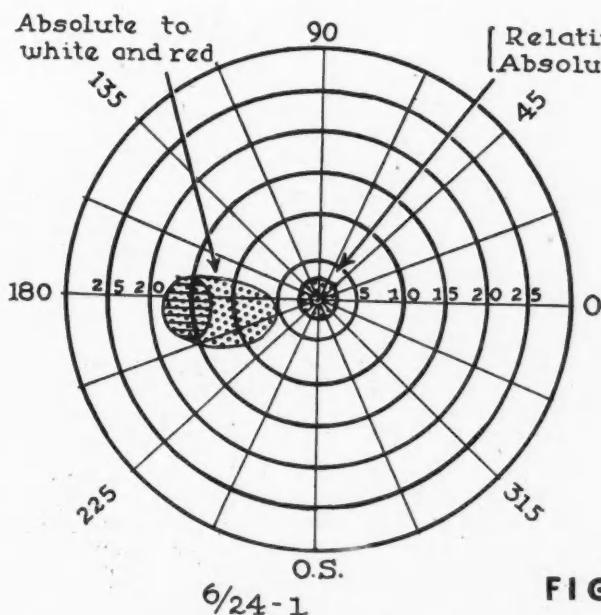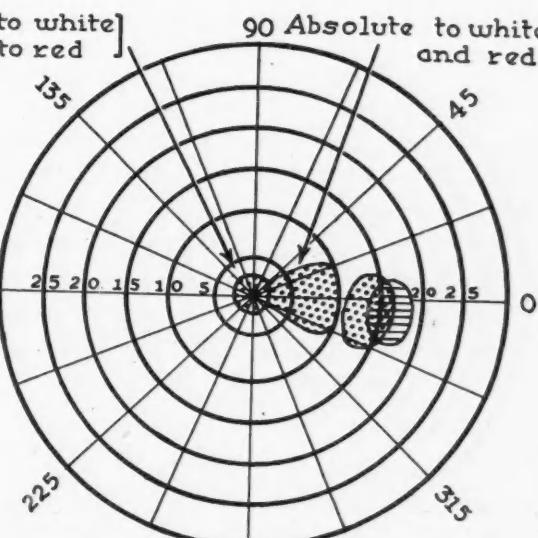
Fig. 1. (Case 1).—Visual fields before treatment. Fig. 2. (Case 1).—Central fields after 4 months' treatment.

eyes which extended to the frontal region. These pains were aggravated by stooping. His visual acuity was found to be 6/120 in both eyes and there were bilateral centrocæcal scotomata to a white test object and a defect centrally to green and red test objects (Fig. 1). The right visual field showed a peripheral concentric constriction. There was no definite pallor of the optic discs. The patient denied any excessive alcoholic intake and he had been taking no drugs. He smoked a pipe, using a package of tobacco in about 4 days.

the findings in the eyes, neurological examination was essentially negative except that vibration sense was grossly impaired in both lower limbs. The hæmoglobin was 64%, R.B.C. 3.0, W.B.C. 6.9, hæmatocrit 32%. The smear showed macrocytosis and anisocytosis and the cells were hyperchromic. A smear from the bone marrow was compatible with pernicious anæmia. Gastric analysis revealed no free HCl. The diagnosis was pernicious anæmia with optic nerve involvement.

On May 21, liver therapy was commenced with weekly

injections of 4 c.c. liver extract intramuscularly which was reduced to 2 c.c. weekly after 3 weeks. At this time his hæmoglobin had risen to 81% and the R.B.C. were 3.6. The paræsthesia progressively diminished and he regained his sense of wellbeing. By September his strength was much improved, the paræsthesia had disappeared, visual acuity was 6/24 in both eyes and the scotomata had decreased in size (Fig. 2). The hæmoglobin was 83%, R.B.C. 4.3 and the blood smear was normal. There was some return of vibration appreciation in the lower limbs. He was discharged from hospital and remained at home doing light work.

The patient returned to hospital for follow-up examination on January 8, 1952. He stated that he felt well in all respects and that his vision had progressively improved. The visual acuity was OD 6/9, OS 6/9 minus 1, corrected. There was now no peripheral constriction of the visual fields and the central fields showed only small relative paracentral scotomata (Fig. 3). The optic discs were considered to be within normal limits. Neurological examination otherwise revealed no significant findings. Vibration was well appreciated everywhere except at the left great toe. Hæmoglobin was 82%, R.B.C. 4.8, smear normal.

On examination he was intelligent and co-operative. There was atrophy of both optic discs. Visual acuity was OS > 6/60, OD 6/60. Examination of the visual fields revealed bilateral scotomata of the centrocæcal type, the major defect lying between the fixation point and the blind spot (Fig. 4). The lower limbs were weak and spastic with clonus at the knees and ankles, hyperactive tendon reflexes and bilateral plantar extensor responses. The abdominal reflexes were present and equal. Superficial sensation was not impaired. Sense of position and passive movement was grossly defective in the feet and toes and vibration was not appreciated in the lower limbs. Blood examination showed hæmoglobin 90%, R.B.C. 5.2, smear normal. There was no free HCl on gastric analysis.

His medical attendants recognized that the absence of any suggestion of pernicious anæmia in the blood examination did not eliminate the possibility of previous pernicious anæmia which had been adequately controlled by treatment. However, it was thought that the history of onset and the findings of optic nerve involvement together with a severe spastic paraplegia were more in keeping with a diagnosis of neuromyelitis optica.

The patient was discharged from hospital and took

Fig. 3. (Case 1).—Visual fields after 8 months' treatment.
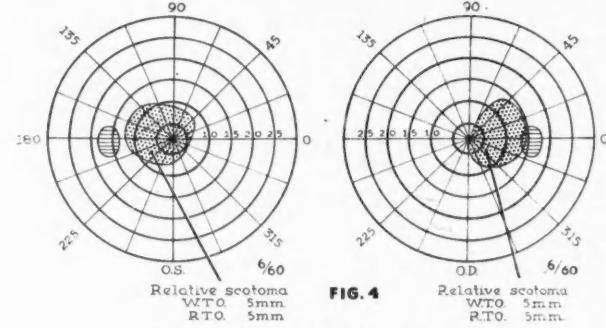
Fig. 4.—Central fields in Case 2.

Comment.—In this case the visual impairment was an initial symptom and it dominated the clinical picture throughout. Loss of vibration sense in the lower limbs was the only other objective evidence of neurological involvement. Liver therapy instituted 6 months after the onset brought about gradual return of visual acuity and subsidence of the centrocæcal scotomata as well as recovery from the other symptoms and signs of pernicious anæmia.

CASE 2

Mr. C.A., age 54, was first admitted to the Toronto General Hospital November 27, 1939. He had enjoyed good health until 1932 when numbness and tingling of the fingers and toes developed. These symptoms increased and he observed that his vision was gradually failing. During the following year his legs became progressively numb, weak and unsteady and his vision extremely defective. In June, 1933, he suddenly collapsed unconscious and remembers very little of what transpired for the next 3 days. Subsequently he was unable to walk and was incontinent, experiencing troublesome flexor spasms of his legs. At the time of his collapse his doctor examined his blood and told him he had pernicious anæmia. For one year he received injections of liver extract after which he was instructed to eat 2 pounds of liver daily but he gradually reduced this to half a pound daily. During the 5 years prior to admission he stated that there was progressive improvement in the use of his legs and in his vision. The sphincter disturbance recovered completely.

no further liver therapy. He was readmitted July 14, 1944, with the history that during the 5 years since his previous admission he had continued to get around using 2 canes without noting any definite change in the disability of his legs or in his vision. He complained that for a month or more he had been tiring easily, had developed tingling in his fingers and had experienced a tight, gripping sensation in the epigastrium. His appetite had become poor, he often felt nauseated and on occasions had vomited after breakfast. In recent weeks he had experienced shortness of breath and swelling of the ankles towards evening.

He was pale and slightly icteric. The tongue was clean and very smooth. The heart was markedly enlarged. The findings in the lower limbs of severe spasticity and weakness with gross impairment of postural sense and loss of vibration sense were essentially the same as on his previous admission. The visual acuity was >6/60 in both eyes, the discs were pale and flat and examination of the visual fields showed large scotomata similar to those found previously. The principal change was that there was now marked peripheral concentric constriction of both visual fields. The hæmoglobin was 22%, R.B.C. 1.0, C.I. 1.1, W.B.C. 1.6. The smear showed marked anisocytosis and macrocytosis with good hæmoglobin content. The platelets were moderately reduced.

The diagnosis was pernicious anæmia and subacute combined degeneration with associated bilateral optic atrophy. The patient was given liver extract 2 c.c. intramuscularly each week. On this therapy there was progressive improvement in the symptoms of pernicious anæmia and in the blood findings. Examination of the blood October 23, 1944, showed hæmoglobin 85%, R.B.C. 5.0, smear normal. There was some improvement in the power of the lower limbs and he was able to appreciate vibration at the iliac crests which had not been the case on admission. Otherwise the visual and

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neurological findings were unchanged. He was discharged from hospital to continue on liver therapy at home. When last seen, April 22, 1947, he was entirely free of paræsthesia and was able to work in his garden with the support of a cane. The findings on examination of his eyes and lower limbs showed no essential change from those recorded 2½ years previously.

Comment.—As in Case 1, the visual symptoms occurred early in the disease, appearing shortly after the initial symptom of paræsthesia. The sudden collapse one year after the onset was accompanied by a marked increase in severity of the cord symptoms. Liver therapy following this severe exacerbation of pernicious anæmia, controlled the anæmia but the dosage was not sufficient to effect any improvement in the other manifestations. The finding of optic atrophy associated with severe spinal cord disease 7 years later led to the wrong diagnosis of neuromyelitis optica which was subsequently revised when he developed the signs and symptoms of pernicious anæmia as a result of being taken off liver therapy.

CASE 3

Mrs. M.S., age 49, was admitted to the Toronto General Hospital March 25, 1933, with complaints of indigestion and shortness of breath for 2 months, vomiting and weakness for 1 month and failing eyesight for 6 days.

The patient had always been of a nervous temperament and since her husband's death 5 years before she had had a variety of symptoms which were considered functional. Her nervous instability had been made worse by the development over 3 years of progressive deafness and tinnitus. It was difficult to get a clear history but included in her complaints were numbness and tingling of the hands and feet for the previous 4 years.

She was very anxious and apprehensive, looking older than her stated age. She was poorly nourished and decidedly pale with an icteric tint to the skin. There was severe bilateral deafness of the inner ear type. The tongue was red and the edges were very smooth. She was almost completely blind, having difficulty in distinguishing between light and dark, and unable to count fingers. The pupils reacted only very slightly to light. The fundi were not abnormal. Coarse nystagmus was present on deviation of the eyes to the right and to the left. There were no significant findings in the upper limbs. The abdominal reflexes were active and equal. In the lower limbs there was no severe weakness but the power was impaired at all joints. The legs were slightly hypotonic and the tendon reflexes were absent at the knees and ankles. Plantars were flexor. There was no impairement of superficial sensation or sense of position. Vibration was not appreciated below the knees. The hæmoglobin was 62%, R.B.C. 2.7, C.I. 1.1. The smear was characteristic of pernicious anæmia. The diagnosis was pernicious anæmia with mild subacute combined degeneration and bilateral retrobulbar neuritis.

The patient was given 2 c.c. liver extract intramuscularly daily and over the course of the next few weeks there was considerable improvement. On May 16 the hæmoglobin was 79%, R.B.C. 4.6. She was looking and feeling very much better. The vision was a little improved: OD 2/80, OS 1/80. It was impossible to test her fields accurately because of poor co-operation but large scotomata could be demonstrated by confrontation in both visual fields involving central vision. At this time it was noted that the discs were becoming pale. The

paræsthesiæ were subsiding and the power in the lower limbs had improved.

She was taken off intramuscular liver and given the juice from 1,000 gm. daily. Evidently she did not take this regularly and in July it was noted that her neurological condition had regressed. In addition to the former findings there was now some weakness, clumsiness and defective stereognostic sense in the hands with impaired sense of position in the fingers and toes. The anæmia had not relapsed. Intramuscular liver therapy was resumed and there was gradually progressive subjective and objective improvement. At the time of discharge from hospital her gait was good and the only abnormal findings in the limbs were absent tendon reflexes in the legs and inability to appreciate vibration below the knees. The vision remained grossly defective but she was able to count fingers at 2 feet with either eye. The discs showed well marked optic atrophy.

Because of her visual impairment, deafness and marked emotional instability the patient was sent to a home for incurables where she has remained until the present time. She would not co-operate with treatment and liver was taken irregularly for a considerable number of years. The result was that the neurological disease progressed materially. The most recent information indicates that she is unable to walk, almost blind as previously and that she shows paranoidal delusions.

Comment.—The history suggests that this patient with subacute combined degeneration had suffered from pernicious anæmia for several years before the onset of visual symptoms. Judging by the severity of the amblyopia on admission and the short history of previous visual difficulty the process in the optic nerves was unusually fulminating in this case. Owing to her mental state she did not receive adequate sustained liver therapy which may account for the absence of any significant recovery of vision.

CASE 4

Mr. T.C., age 68. Admitted January 11, 1946. This patient was extremely deaf, with defective memory and all his answers to questions were very vague. Therefore an adequate history was difficult to obtain but it was learned that for one year he had been unable to see anything with the right eye and that there had been progressive loss of vision in the left eye. His health had been poor for several years, rendering him too weak to work, but evidently about 5 months before admission there had been a marked increase in his symptoms. These included generalized weakness, anorexia, nausea, numbness and tingling of the fingers and toes and clumsiness in all 4 limbs.

On examination he was extremely emaciated and pale with a lemon tint to the skin. The tongue was clean with smooth edges. The spleen was just palpable. The patient was totally blind in the right eye but could appreciate light and the movements of a hand with the left eye. There were bilateral lens opacities with evidence of senile degenerative change in the right cornea. He had severe bilateral deafness of the perceptive type. The power was poor in all 4 extremities. The knee jerks were difficult to elicit and the ankle jerks were absent. Vibration was not appreciated up to and including the iliac crests. Blood examination showed hæmoglobin 26%, R.B.C. 1.1, C.I. 1.1, W.B.C. 5.4. The smear was characteristic of pernicious anæmia. On gastric analysis there was no free HCl present. The diagnosis was pernicious anæmia.

Liver therapy was instituted and there was progressive improvement in his general condition and in the anæmia. On March 25 the hæmoglobin was 77%, R.B.C. 4.8, C.I.

0.8. A successful operation for removal of the cataract in the left eye was carried out at this time. Subsequently it was found that the left optic disc was extremely pale and flat, indicating well advanced optic atrophy. There was no improvement in his vision which remained the same as before operation. The patient was discharged from hospital to continue with weekly injections of liver extract. He was seen one year later (May, 1947) at the clinic. His general health and strength had continued to improve and there was some return of vibration appreciation in the lower limbs. The deafness and blindness were unchanged.

Comment.—This case is a less satisfactory example than the other 3 cases because of the complication of the cataracts and also because the unreliable history made it impossible to be sure of the time relationship between the onset of the visual deterioration and of the symptoms of pernicious anæmia. However the absence of any other obvious cause for optic atrophy in this patient and the fact that he was able to work prior to the development of constitutional symptoms, make it reasonable to suppose that the optic nerve involvement was associated with the pernicious anæmia.

DISCUSSION

In Cases 1 and 2 where the visual fields could be accurately recorded the nature of the central field defects conform with those reported by others. Turner[2] was the first to give adequate data concerning the visual field defect found in pernicious anæmia. Two of his cases showed oblong scotomata with the fixation point at one end of the scotoma which extended to involve the blind spot or stopped just short of it. His third case showed large paracentral scotomata which included the blind spot. He found only slight general constriction of the peripheral fields. Similar observations have been described in one case by Traquair,[3] in one case by Walsh[4] and in three cases by Benham.[1] Thus with our 2 cases there have been 10 cases of pernicious anæmia reported in which scotomata conforming to the centrocæcal pattern have been present. The data is not adequate in the other recorded cases for conclusions about the nature of the visual field defects.

Although centrocæcal scotomata have been observed in a number of diseases affecting the optic nerves they have not been regarded as a common finding apart from tobacco amblyopia where they have been considered to be the rule.[5] Unless it is recognized that field defects of this nature may occur with pernicious anæmia such cases are liable to be missed, particularly when, as occasionally happens, visual failure is the earliest symptom of the disease.[6, 2] In our Case 1 visual impairment was an initial symptom and it continued to dominate the clinical picture for 6 months. No examination was carried out to exclude pernicious anæmia when the patient was first seen and he was erroneously thought to have a toxic amblyopia.

Mistakes in diagnosis may occur also when optic nerve involvement is found associated with subacute combined degeneration, particularly if there is no significant degree of anæmia present. Various neurological diseases in which the optic nerves and spinal cord may be affected together have to be differentiated, notably disseminated sclerosis and tabes dorsalis. In Case 2 the failure to appreciate that the visual findings could be a part of the picture of subacute combined degeneration led to a wrong conclusion that the patient was suffering from neuromyelitis optica. With more general awareness that the optic nerves may be involved in pernicious anæmia such mistakes are unlikely to occur particularly when the scotomata are found to be of the centrocæcal type pointing to degenerative change in the retinal ganglion cells as well as the papillomacular bundle of the optic nerve.[7] In other neurological diseases where the optic nerves and spinal cord may be affected together, such as disseminated sclerosis, the usual finding is a pericentral scotoma with the fixation point in the centre of the scotoma.

Including our Case 1, there are 10 cases recorded where the results of adequate liver therapy have been described and in most of these decided improvement in the amblyopia has taken place. It is evident that treatment will be effective only in cases where no marked degree of optic atrophy exists. Our Case 1 shows the excellent recovery of vision that can take place with liver therapy even with symptoms of 6 months' duration, when there is no pallor of the optic discs. There are other cases in which visual symptoms have been present for as long as a year before treatment was administered with very good recovery of vision.[6, 2, 1] Since liver therapy is so often effective in restoring vision if administered before irreparable damage has occurred, it is advisable that every middle-aged patient presenting with progressive loss of vision be investigated for pernicious anæmia. Such in-

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vestigation is particularly indicated if examination of the visual fields shows scotomata of the centrocæcal type, even if a history of excessive smoking is obtained. If the blood findings are in any way suggestive of pernicious anæmia and there is no free HCl on gastric analysis a therapeutic trial of liver therapy is indicated.

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CASE REPORTS

GIANT BENIGN ULCERATIONS OF THE DUODENUM

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THE MAJORITY of benign ulcer craters in the duodenal bulb are small, ranging in size from 0.1 to 1 cm. in diameter. However a review of the literature shows 12 reported cases of giant duodenal ulcer with craters ranging in size from 2 cm. in diameter to 5 x 6 cm. The entity giant benign duodenal ulcer was first described by Brdiczka in 1931,[1] reporting on three cases. Since then nine more cases have been cited in the literature.[2 to 6] Thus the present case appears to be the thirteenth. Of the thirteen cases only five were diagnosed ante mortem; the unrecognized cases died of hæmorrhage or complications of hæmorrhage. Since the failure to recognize this condition results so commonly in death, one object of this report is to remind us of its existence so that early diagnosis may lead to timely treatment, which is usually surgical.

That small ulcers may be missed on x-ray examination seems entirely possible, but at first glance it may seem strange that the giant ulcers could be missed. In most of the cases reported the barium series were reported as normal because the ulcers filled with barium were so large that they were interpreted as normal duodenal caps. Fluoroscopically it was noted that the contrast material rushed in and filled the crater rapidly, but that emptying time was slow and the walls of the crater remained smooth, rigid and unchangeable. Because the non-ulcerated portion of the wall was stretched, the normal mucosal pattern was not seen. The consensus seems to be that fluoroscopic examination should

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be repeated whenever there is any suspicion of abnormal rigidity or delayed emptying of the duodenal bulb.[6]

A 53 year old veteran was first admitted to the medical service of St. Mary's Hospital on October 10, 1951, with complaints of colicky pain over the epigastric region for four months previous to admission, and vomiting one hour after meals for two months previous to admission. The patient complained of decreased appetite since the appearance of the pains, constipation for the same length of time and blood in the stools noted once some three months prior to admission.

Physical examination on admission revealed a poorly nourished adult white male with a sallow complexion, in mild respiratory distress who spoke in a weak hoarse voice. The blood pressure was 210/140. The abdomen presented tenderness over the costal margin bilaterally, and the superficial veins of the lumbar and iliac regions were distended. Liver dullness was percussible three finger-breadths below the costal margin, though no sharp edge could be felt. The spleen was not palpable and no costolumbar tenderness was noted.

The laboratory findings on admission were; no anæmia, neutrophilia without shift to the left and a slightly increased sedimentation rate. Serum proteins were 7.3 gm. %, NPN 36.6 mgm. %, and cholesterol 229 mgm. %. The blood Wassermann was negative. Urinalysis was negative. The electrocardiogram showed a normal pattern. A chest x-ray revealed a dense, homogeneous opacity of the left apex. A barium series was interpreted as showing a small, active ulcer of the pylorus.

With a view to following up the chest lesion a bronchoscopy was performed. On October 13, it was reported as negative; on October 22, a biopsy of a node on the 11th left rib was taken and the pathologist reported it as an anaplastic malignant tumour, possibly arising from an oat-cell bronchogenic carcinoma. The barium series was repeated one week later and no activity of the ulcer could be demonstrated. A barium enema was done and the large bowel was reported as normal. The patient was then discharged and roentgentherapy was arranged.

One month later, on November 26, the patient was admitted to the Queen Mary Veterans' Hospital, complaining of tightness in the chest, coughing and expectoration. He also complained of poor appetite and vomiting. Physical examination revealed findings similar to those at St. Mary's Hospital one month previously, with the exception that auricular fibrillation had now been added. The patient began to complain of low back pain and cramps in the left leg, and on December 6, he vomited coffee-ground material. This condition responded somewhat to sedatives and antispasmodics.

For palliation the patient was placed on intravenous nitrogen mustard. On December 24, there was marked leukopenia and anæmia; 1,000 c.c. of blood was given. The patient's course continued progressively downhill and he died on January 16, 1951.

Autopsy revealed a giant ulcer crater 5.5 x 5 cm. and approximately 1.5 cm. in depth, sitting on the pancreas

and revealing a thrombosed artery on its floor (Fig. 1). The ulcer included part of the pylorus, but was mostly in the first portion of the duodenum. Microscopic examination of sections taken from the specimen showed the usual findings of a chronic peptic ulcer, and no evidence of neoplasm or metastases was found.

The radiologist in reviewing the films felt that the main reason for missing the greater part of the ulcer had been its large size. The portion which had ulcerated the pylorus was seen, but the greatest part of the ulcer was taken to be a fairly normal duodenal cap (Fig. 2).
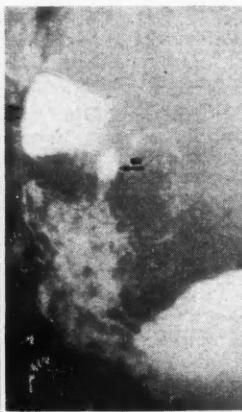
Fig. 1   Fig. 2

Fig. 1.—Large ulcer of the duodenum measuring 5 x 5.5 cm. with a thrombosed vessel in its floor is shown. The lower portion of the specimen shows the dilated duodenum. Fig. 2.—Roentgenogram after ingestion of barium shows what at B was taken to be a duodenal ulcer and what at A was considered to be a fairly normal duodenal bulb. At autopsy the ulcer encompassed all of A and B.

SUMMARY

1. A thirteenth case of a fairly rare clinical entity, giant benign ulcer of the duodenum, is presented.

2. Since all cases in which the diagnosis was missed died of hæmorrhage, it is important that the entity be kept in mind especially in those cases which present G.I. symptoms and have an apparently normal duodenal bulb on x-ray examination.

3. Certain x-ray characteristics are presented which may aid in diagnosing giant benign ulcers of the duodenum.

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UNUSUAL ROENTGENOGRAPHIC FINDINGS IN GANGRENOUS APPENDICITIS

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MR. E.D. A WHITE FARMER, age 30, began having epigastric pain the evening of February 20, 1951. He slept very little during the night and vomited on two occasions. The following day his appetite was poor and he was nauseated on several occasions. Eighteen hours after the onset of the epigastric pain, the pain settled down to the right lower abdomen. At the time of admission to hospital on February 22 the pain was quite severe, involving the right side of the abdomen from the rib margin to the pelvis. The past history was non-contributory.

He was a sick looking man, with a temperature of 100° F., pulse 88, and respirations 24. The The positive physical findings were limited to the abdomen and rectum. The abdomen moved very little with respiration and on palpation there was considerable involuntary rigidity over the right half of the abdomen, more marked in the right lower quadrant. Light percussion was quite painful over this region and on auscultation the bowel sounds were definitely diminished as compared to normal. On rectal examination he was tender high on the right.

Following completion of the physical examination, the differential diagnosis considered was appendicitis with spreading peritonitis versus ruptured peptic ulcer with leakage down the right colic gutter.

The laboratory and roentgenographic findings were as follows: Urinalysis normal but for a high specific gravity; white blood count was 14,400, with 94% polymorphonuclear leucocytes; the sedimentation rate was 30 mm. in 60 minutes; and the erect and supine (Fig. 1) roentgenograms of the abdomen were interpreted as follows by Dr. Omar Legant:

"Erect and supine films of the abdomen reveal no evidence of free air under either diaphragm. There is a moderate amount of distension of the colon and a few loops of small intestine. It is noted that the appendix appears to be outlined by air in its lumen. The appendix is retrocæcal and extends quite high in the right lumbar gutter. This is a most unusual finding and probably denotes a complete obstruction at the base of the appendix, causing a mechanical ileus of the appendix. Radiopaque medication or barium outlines the cæcum and transverse colon." (The nature of this radiopaque material could not be determined by questioning the patient).

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The roentgenographic findings were certainly interesting and also helpful in determining the operative approach. The abdomen was entered through a high McBurney muscle-splitting incision, the incision overlying the above mentioned gas shadow. There was a moderate amount of turbid, yellow peritoneal fluid, but no odour was noted. The appendix was found lying high in the retrocæcal position and was gangrenous from base to tip. It was readily removed and 1,000,000 units of penicillin and a gram of streptomycin in an ounce of saline were placed in the right colic gutter. The abdomen was

Fig. 1.—Arrow pointing to gas-filled appendix.

closed, with a small Penrose drain down to the peritoneum. The patient made an uneventful postoperative recovery.

On opening the appendix some odorous gas and brown liquid fæcal material escaped. The base of the appendix was completely obstructed. Cultures were not obtained.

I have been unable to find a reference to a similar roentgenographic report in the literature, but feel sure that such a finding would not be rare if roentgenograms were made in a series of gangrenous closed-loop appendiceal obstructions.

SUMMARY

An unusual case of gaseous gangrenous appendicitis has been presented, the gas-filled appendix being well outlined on the roentgenograms. This latter finding was of definite assistance in the differential diagnosis and in determining the correct operative approach.

CYSTIC LYMPHANGIOMA OF THE AXILLA

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CYSTIC LYMPHANGIOMATA are uncommon congenital tumours of lymphatic tissue which are most common in the neck but have been reported in the axilla, mesentery, sacrum, mediastinum, inguinal and sacral areas.

Etiology.—There have been numerous theories as to the origin of these tumours, the one most widely accepted being that of Goetsch, which is adequately set forth in his excellent article on the subject.

According to Sabin the lymphatic system originates in two stages. In the first stage a capillary plexus forms on the jugular vein of each side, these subsequently separate from the parent veins, and dilate to form two symmetrical sacs lined with endothelium. The thoracic ducts form to connect the pelvic sacs with the jugular sacs which rejoin the veins at the jugular valves. In the second stage, that of peripheral growth, endothelial fibrillary sprouts radiate out from the jugular sacs, penetrating the surrounding tissues. The newly formed lining secretes a material similar to lymph which transforms the sprouts to an endothelial-lined channel, the primitive lymphatic.

Goetsch believes, and has shown by his study of his cases, that these tumours originate as a result of the sequestration or failure to make connection with the venous system of this primitive lymphatic tissue which retains its embryonic power of growth by sprouting, penetration, and secretion. Just why this sequestration should occur or what the predisposing causes are is unknown; growth anomaly, fibrosis and accident have all been suggested. This theory of origin would explain the pathological and clinical findings in this condition. The endothelial fibrillary sprouts penetrate the clefts of adjoining tissues, droplets of secretion are formed by the cells, the cyst-like spaces resulting from dilatation. Tissues such as muscle fibres become strangulated and converted to fibrous tissue.

Pathology.—Grossly these lesions vary in size from a marble to the size of a child's head and consist of multilobular, multilocular cystic masses. The cysts vary in size from a pin head to the size of an egg. The older cysts have thick fibrotic walls, while the younger ones have thin

and friable walls. The cysts are rarely tense, contain a serous watery or straw-coloured fluid, occasionally it is turbid or blood stained. This fluid does not contain albúmen or globulin, it has a protein content of 5 to 10%, does not coagulate on boiling, the sediment contains cholesterol crystals, lymphocytes, monocytes, large phagocytes, and occasional polymorphonuclears. Not infrequently there are fibrous strands extending across the cyst cavity, these are believed to be remnants of blood vessels strangulated by the growth of the tumour. In the stroma between the cysts may be found enlarged and hyperplastic lymph nodes. The overlying skin shows evidence of atrophy and infiltration.

On microscopic examination the cysts are seen to be lined with a single layer of endothelial cells similar to those lining the lymphatics and blood vessels. The strands which are sometimes noted crossing the cyst cavities are found to be obliterated vessels containing hyaline thrombi the result of strangulation occurring during development of the cyst. The walls of the older cysts are composed of thick fibrotic tissue with few blood vessels. The younger cysts may be separated merely by a few connective tissue fibres and occasional small capillaries. In the walls of the younger cysts there may be collections of lymphoid elements, even germinal centres, indicating its capacity to form all the elements of the lymphatic system. At the periphery of the tumour its method of infiltration and development may be seen; explaining its characteristic adherence to the surrounding normal tissues particularly muscle.

Clinical features.—This is essentially a lesion of infancy, 50% of the cases have a tumour at birth, 90% develop one on or before the second year, although cases have been reported in which it did not appear until adult life had been attained. It appears to be more common in females, and the majority are on the right side of the body.

The tumour is usually slow growing but may be rapid, furthermore it may decrease or even disappear for a time to be followed by a reappearance at a later date. Infection is prone to occur and when it does it is very serious, causing severe illness and even death. The infecting organism is usually a streptococcus. Infection which subsides may be followed by a cure. Ill advised surgical procedures are the usual cause of infection developing.

The signs and symptoms are those of a non-painful, non-tender, soft to hard, fluctuant, slow-growing mass. In infants it may be associated with anæmia and malnutrition.

In the differential diagnosis, the lesions to be considered are lipomata, sebaceous cysts, neoplasms of the structures in the axilla. The diagnosis is made on a basis of history and physical examination. The Duffy procedure, aspiration of the cysts and the injection of 15% sodium iodide, and x-ray have been advocated, but the danger of infection has tempered the enthusiasm for this method.

Most cases, if untreated, result in death from infection, malnutrition or involvement of vital structures before puberty. Some, however, disappear or are cured as a result of non-fatal infection. These tumours continue to infiltrate and grow as time goes on and can extend from the axilla into the neck or mediastinum where they will manifest themselves by pressure on the vital structures.

Treatment. — Various methods of treatment have been advocated for this lesion. Aspiration is of no value, even dangerous due to the possibility of infection. Incision and drainage is even more dangerous for the same reasons as aspiration. Neither of these methods can result in cure because of the multicystic nature of the tumour. The injection of sclerosing solutions, *e.g.* sodium morrhuate has been tried but has also proved unsatisfactory. Figi recommends radiation in an attempt to obtain lower mortality and believed it to be satisfactory.

The consensus at this time appears to be that these tumours should be treated by radical excision, being sure to remove all involved tissue, unless this is done a recurrence is to be expected. The mortality rate for excision is high, 20 to 40%, but when compared with the results in the untreated, and those cases treated by other methods it is not prohibitive.

Baby W. was born on October 28, 1950, full term, R.O.A., uneventful delivery, the third child of a healthy mother. He was an apparently healthy male child, weighing 6 lb. 5 oz., except for a cystic tumour of the right axilla, preventing adduction of the arm.

On October 29 the baby was seen in consultation. The tumour consisted of a nodular multicystic mass which apparently originated in the right axilla, being adherent to the axilla and the lateral chest wall. It measured roughly 10 x 5 cm., the anterior nodule felt cystic, and the skin over it was adherent.

The baby was kept in the Kelowna General Hospital and its development and weight gain were normal. The tumour did not appear to be growing.

On November 25, the W.B.C. were 18,600, R.B.C. 3,500,000, Hgb. 18.2 gm., clotting time 4 mins. 6 sec.,

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differential count normal. On December 4 under drop ether anæsthesia the tumour was removed. It was found to be densely adherent and infiltrating the pectoralis major and the biceps, portions of the muscles were removed with the tumour.

The postoperative course was uneventful and the child was discharged on December 14, 1950. He was subsequently seen at 6 months and 10 months of age at which time he had no evidence of recurrence, full range of arm motion and apparently normal development.

The pathological report by Dr. H. H. Pitts, of St. Pauls Hospital, Vancouver, was as follows:

Gross.—The specimen consists of a number of portions of tissue which would appear to constitute the wall of a cyst-like structure which, when intact, would measure about 4 to 5 cm. in diameter. The lumen of this cystic structure appears to be trabeculated and to be traversed by numerous smaller and larger fibrous septa. Two of the larger portions are covered by rather taut skin.

Microscopic.—Several sections were taken through various portions of the tissue received and they show many large, almost cavernous vascular channels with fairly thick walls lined by single layers of compressed appearing endothelium and some of them are very markedly dilated. There are, in some, evidence of a hæmorrhage extravasation and some chronic inflammatory reaction in the presence of small aggregation of a well vascularized granulation tissue. The supporting

Fig. 1

stroma is of a fairly dense, somewhat œdematous fibrous connective tissue.

Diagnosis.—Cystic lymphangioma (cystic hygroma) of axilla.

SUMMARY

The etiology, pathology, clinical features and treatment of cystic lymphangiomata of the axilla have been briefly outlined. A successfully treated case is reported.

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ACUTE STAPHYLOCOCCAL SEPTICÆMIA CURED WITH SYSTEMIC BACITRACIN*

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THE CASE of a paraplegic patient with staphylococcal septicæmia is reported because it represents an instance in which recovery may be credited to the systemic use of bacitracin. In this era of antibiotics cases of acute bacterial septicæmias with fulminating courses have been uncommon, but there is an alarming increase in the number of infections caused by strains of staphylococcus which are resistant to penicillin. Recent studies by Greey[1] indicate that in more than 50% of the patients studied bacteriologically because of staphylococcal infections in the Toronto General Hospital the organisms were penicillin-resistant. This case is of interest because the clinical manifestations of septicæmia were striking and control of the infection was not obtained during a two and one-half week period, when therapy included terramycin, penicillin and streptomycin.

On November 2, 1951, a 19 year old male was admitted to the Toronto General Hospital. A week before he had been struck on the lower thoracic area of his back by the skip of a cement mixer, with instantaneous loss of power and sensation in his lower limbs and trunk, and loss of bladder and bowel function. Treatment in another hospital had consisted of immobilization on a Stryker frame, and drainage of the bladder with an indwelling catheter.

He was a well developed, well nourished, young adult male. There was a flaccid paraplegia below the level of the umbilicus with absence of all tendon reflexes in the lower extremities. Upper abdominal reflexes were present but reduced. All forms of sensation were lost below the level of the tenth dorsal segment of the spinal cord. There was marked prominence of the spinous process of the 11th thoracic vertebra with local tenderness.

Lumbar puncture between L.4 and L.5 revealed yellow fluid with no measurable pressure. There was a complete block as demonstrated by jugular compression. C.S.F. protein—2.5 gm., cells—9,814 R.B.C./c.mm., 136 W.B.C./c.mm.

X-ray showed a fracture dislocation of T.12 on L.1 with reversal of the articular facets and anterior displace-

ment of T.12 on L.1, for almost the complete width of the superior surface of the body L.1.

Course in Hospital (See Fig. 1).

On the 7th hospital day, he was scheduled for exploratory bilateral partial hemilaminectomy and reduction of the fracture dislocation under direct vision and spinal fusion. This procedure was to have been carried out in conjunction with the Orthopædic Service, but on the 5th hospital day his rectal temperature rose to 100° and on the 7th hospital day he had a severe chill with a fever of 103°.

At this time after consultation with the Urological Service he was started on terramycin 250 mgm. q.i.d., and gantrisin gm. 1 q.i.d., which he had been receiving since admission, was discontinued. At this time he was vomiting and required intravenous fluids. From the 8th to the 16th hospital day he continued to run a swinging fever ranging from peaks of 103 and 104° to low points of 101 to 99° with severe chills at the height of the swings. It was thought that the fever was due to a genito-urinary infection. Cultures of the urine on the 15th day had shown the presence of *B. proteus, Staph. pyogenes* and *Strep. fæcalis*, which were resistant to terramycin. On the 16th day the terramycin was discontinued and slow-absorption penicillin and dihydrostreptomycin sulphate begun.

On the 19th hospital day, it was noted that his spleen was palpable and tender. The axillary glands were palp-

Penicillin 7.2 million units
Terramycin 6.0 gm.
Streptomycin 32.0 gm.
Bacitracin 1.8 million units

Clinical course—First 61 days of illness   First hospital day represents 8th day of illness.

Fig. 1
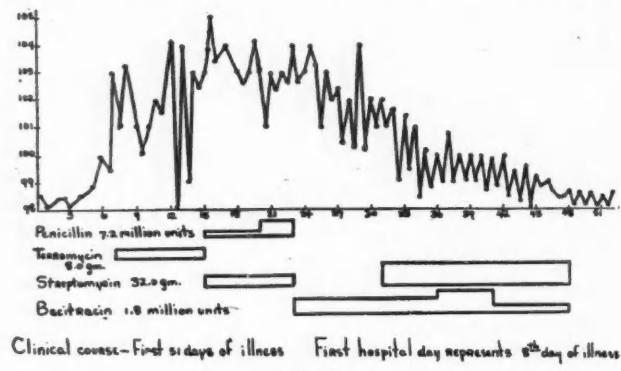
ably enlarged but not tender. A blood culture taken on the 18th day grew *Staph. pyogenes*, 65 colonies per c.c.

This strain was sensitive to 2.5 but not to 1 unit per c.c. of penicillin, resistant to more than 100 mcgm./c.c. of chloromycetin, 100 mcgm./c.c. of streptomycin, 10 mcgm./c.c. of terramycin and 10 mcgm./c.c. of aureomycin. On the 21st hospital day aqueous penicillin, 200,000 units q.4 h., was begun.

A second blood culture taken on the 19th day revealed 17 colonies per c.c. It was sensitive to 50 but not to 25 units of penicillin per c.c. On the 22nd hospital day tests showed that the strain was sensitive to bacitracin in amounts of 0.4 units per c.c.

On the 24th hospital day the patient's general condition was worse and an effusion into his left knee joint had occurred. Cultures of the fluid aspirated from the knee joint on two occasions were negative. Penicillin and streptomycin were discontinued and the intramuscular administration of bacitracin begun. The initial dosage was 20,000 units q.6 h.[2] In addition, sodium bicarbonate was given in sufficient doses to produce an alkaline urine. On this date the presence of a pleural friction rub over the left lower chest posteriorly and marked tenderness with accompanying fullness in the left loin was found, suggesting the possibility of a perinephric abscess on the left side.

On the 25th hospital day—2nd day of bacitracin therapy, the patient coughed up a small quantity of blood-stained mucus. Culture of the sputum taken at this time grew *Staph. pyogenes*.

On the 27th hospital day—4th day of bacitracin therapy, in spite of a temporary drop in fever to 101° there

was no evidence of clinical improvement. Examination revealed a slight meningismus, bilateral basal rhonchi, marked increase in the effusion in the left knee joint, minimal effusion into right knee joint, a questionable change in the 2nd apical heart sound and a palpable and tender spleen. Blood culture on this date grew only one colony per c.c., which showed the same sensitivity to bacitracin as earlier cultures.

On the 28th hospital day—5th day of bacitracin therapy, the patient felt much better and was taking fluids by mouth. He had a definite superficial and deep thrombophlebitis of the left leg. Blood culture on this date was negative. On this day tests for bacitracin in blood showed a trace of activity. Later it was possible to demonstrate 3.0 units of bacitracin per c.c. of serum.

On the 32nd hospital day—9th day of bacitracin therapy, his fever had dropped to 102° with a decreased amplitude of swing. The swelling in his left knee joint and the fullness and tenderness of his left thigh and calf which had been first noticed on the 28th day were less marked. His spleen was still palpable but not as tender. There was no abnormality of the heart sounds. At this time streptomycin 0.5 gm. q.i.d. was begun, because of the possible synergistic action of bacitracin and streptomycin.[2]

On the 36th hospital day—13th day of bacitracin therapy, the fever had dropped to 99° with an evening elevation of 101°. His spleen was palpable but not tender. There was still a diffuse tender swelling in the left loin. The effusion in the left knee had decreased but a diffuse soft swelling of the left lower extremity was still present.

On the 38th hospital day—15th day of bacitracin therapy, the bacitracin was changed to 25,000 units q.8 h. instead of 20,000 q.6 h.

On the 43rd hospital day—20th day of bacitracin therapy, the dosage of bacitracin was decreased to 10,000 units q.8 h. The patient's temperature at this time was varying between 99 and 100°.

On the 49th hospital day—26th day of bacitracin therapy, the patient's temperature was normal. His spleen was no longer palpable and the swelling and effusion of the left knee were almost gone. There remained only slight tenderness in the left loin. Bacitracin and streptomycin were discontinued.

Daily blood cultures taken during the peaks of fever had grown no organisms since the fifth day of bacitracin therapy.

COMMENT

The clinical picture of acute staphylococcal septicæmia is well represented in this case. Chills and high swinging fever, the positive blood cultures, splenomegaly, and the effusions into the knee joints were conspicuous features. There was no definite change in the heart sounds indicative of an endocarditis, neither clubbing of the fingers or toes nor petechiæ were observed.

In vitro studies of the organism proved it to be highly resistant to terramycin, aureomycin, chloromycetin and dihydrostreptomycin. The organism was resistant to 1 unit per c.c. of penicillin when first isolated from the blood and within twenty-four hours was resistant to 25 units per c.c. No benefit accrued to the patient with penicillin and streptomycin therapy.

The organism was sensitive to 0.4 units per c.c. of bacitracin. Five days after the institution of therapy with systemic bacitracin, blood cultures were negative. This was shortly followed

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by subjective improvement with gradual subsidence of temperature and clinical signs.

As careful observations as possible were made regarding renal function in relation to the septicæmia and bacitracin therapy. It must be pointed out that due to the paralysis of the bladder secondary to spinal cord injury, an indwelling catheter was constantly employed. The N.P.N. on admission to hospital was 40 mgm. %. During bacitracin therapy it varied between 32 and 41 mgm. %, until the 43rd hospital day (20th day of bacitracin therapy) then rose to 44 mgm. %. On the 49th hospital day, when bacitracin therapy was discontinued, the N.P.N. was 52 mgm. %; on the 50th day, 62 mgm. % but fell rapidly to 41 mgm. % on the 52nd day.

On admission there was a trace of albumin in the urine but no casts. At no time during bacitracin therapy nor at any time following were there casts found in the urine. The albumin remained present as a trace. Urinary output was good throughout. It is clear that nephrotoxicity was not a problem in this patient who received 1,830,000 units of bacitracin in 26 days, and in quantities below 100,000 units per day, although the N.P.N. rose during the last three days of bacitracin therapy. This supports the view put forward by Meleney, Johnson and Teng.[3] There were no significant toxic effects on the gastrointestinal system nor at local sites of injection. All injections were made intramuscularly into anæsthetic areas so that novocaine was not added to the saline.

SUMMARY

A case of acute staphylococcal septicæmia in a paraplegic patient in which cure followed the parenteral use of bacitracin is reported.

Bacitracin was effective after the course of the illness had not been altered by large doses of terramycin, penicillin and streptomycin.

The effectiveness of bacitracin is of importance in the light of the increasing frequency of penicillin-resistant strains of Staph. pyogenes.

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SPECIAL ARTICLE

PATIENTS AND MEDICAL EDUCATION*

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EN DISCUTANT CE PROBLÈME, il nous parait que nos considérations doivent tout d'abord porter sur le malade. En toutes circonstances, et à plus forte raison quand il s'agit de l'enseignement clinique, l'humanisme du médecin devra prévaloir. Le malade sera toujours l'objet de notre condescendance, précisément parce qu'il est avant tout un être humain, et que nous voulons constamment nous souvenir sa dignité comme tel. Il ne sera jamais à nos yeux et pour notre pensée un "sujet" sur lequel on fait des expériences douteuses ou ôsées, ni du "matériel" que l'on emploie à plus ou moins bon escient. Son traitement ne sera pas retardé pour le bénifice de la clinique à faire, pas plus qu'il ne servira pour la démonstration d'une technique dont on ne connaît pas les résultats immédiats ou éloignés.

Ce point, le premier en importance, est le seul que nous offrons en langue française, de ce travail inscrit au programme comme devant être présenté en langue anglaise. Son énoncé, tant pour le fond que pour la forme, nous a paru de la catégorie des "first things first".

It appears to us that in the discussion of this problem, we should put first things first. Our considerations should at the very beginning bear upon the patient himself. In all circumstances, and more especially when we are dealing with medical education, the physician's humanism should prevail. The patient will always be the object of our solicitude, precisely because, before anything else, he is a human being, and that as such we constantly want to remember his dignity. Nor do we wish to forget for one moment that in the patient-doctor relationship, the nature of the contract between the two is one of freedom between two human beings, with its obligations and its limitations as well for both contracting parties. Thus we shall never forget that the patient, in accordance with our ways of thought and action, is a free human individual endowed with dignity, and not a vague number in a collectivity nor just a part of a whole. Never will he be to our eyes and in our thoughts either a "subject" upon which doubtful or daring ex-

periences can be performed, or part of "material" to be used with more or less discrimination. Never will the proper treatment time be deferred for the benefit of a clinical demonstration with "unimpaired" symptomatology. Never will he be used for the demonstration of a technique the immediate or remote effects of which we know nothing about. That, we thought, we should begin with, since it clearly represents the spirit of free people and the philosophy of the Hippocratic oath.

The matter of what patients can be available for teaching constitutes not only a Faculty problem, but also a puzzling question for the hospital. The Clinical Director has had to cope with it for quite a few years now with more or less sporadic success, because it also involves the field of postgraduate teaching. In reality, it is less complicated in this particular instance. But it is far more severe when it concerns the undergraduate group of students. Had we to answer the question "what patients *are* available for teaching", we would say that there are few and that their selection is a constant headache for those who have to choose them. But when we are asked "what patients *can* be available", the matter can be looked upon with less perplexity, and the possibilities become greater in their potentialities.

We would consider them (a) as to their quantity and (b) their quality. The quality, it seems to us, is most important. Cases selected should represent mostly the types of disease usually met in general practice and not those of unusual and rare syndromes where the clinician's talent and science are apt to be exhibited to the student's awe, without the benefit of his getting anything practical and useful out of it. Keeping one's feet on the ground does seem rather important in the teaching of medicine.

Secondly, we feel that whenever the appearance of patients before the students imposes too great a psychological stress upon them, they should be left alone, to get over their illness, without adding to it new symptoms that both the patient and the treating physician can very well do without. That holds for any type of case, but is to be particularly remembered in gynæcological and psychoneurotic cases. We consider the oversight of this element as a very grave medical error.

The number of cases available is a different matter. There is the most severe and heartbreaking aspect of the problem. In the past, patients hospitalized under the Public Charities Acts were the ones used for clinical teaching, I would say, almost without question or permission asked. That it should be so seemed to be taken for granted and the patients knew it too. The number of cases now hospitalized under the Public Assistance law has constantly dwindled and we now find in the hospital wards a few of them but mostly semi-private cases. These persons pay in part or in whole for their hospitalization out of

their own money. They are entitled to more or less privacy; most of them ask for it, some of them demand it.

Out of these a large and ever increasing proportion comes under the heading of the prepaid medical plans in general. They consider themselves almost as private cases since they have the choice of their own treating physician. That aspect cannot be forgotten.

The organization and operation of anti-cancer clinics have also altered the picture. That this is a definite and remarkable progress in the fight against cancer is unquestionable. But in some centres these cancer cases are looked upon as public cases whilst in others they are considered as semi-private ones. The difference of attitudes renders the problem a bit more intricate.

At first sight the number of cases available for clinical teaching seems to be very much limited. It is in fact, but to a certain extent only, and, in our opinion, can be rather easily increased.

At the 1950 Quebec Division of the Canadian Medical Association annual meeting, we stated in our report on Medical Education that all the cases not paying out of their own money all or part of the yearly premiums of any of the prepaid medical plans, and cases in the same plans hospitalized in the wards, should serve for teaching purposes. We said then that State or Provincial laws should be enacted to this effect. We still hold the same opinion.

Generalized and uniform rulings should be applied to cases of the anti-cancer clinics, in the same direction. These two moves would furnish clinical cases diversified in nature and ample in quantity.

Semi-private cases in hospital rooms do, generally speaking, accept students accompanying the clinician, providing they be in very small groups. We think, and have found out, that three appears to be the maximum desirable. It is especially amongst this group of patients that the clinician's *savoir-faire*, judgment and discretion will bring forth satisfactory results.

But the treating physician's good will is also, in this group, most needed. So much can be achieved by him in the orientation of the patient's attitude and reactions toward the student.

And as far as the private cases are concerned we personally have had a great deal of surprise when we told them that they had no idea of what an immense service they could render to the young students by their occasional acceptance of two or three of them. A goodly number have accepted with good grace if not with pleasure. We could suppose that it was prompted by their fundamental "Love thy neighbour" spirit.

We feel, and know, that when the students are subdivided into very small groups, (the very maximum being four, the optimum being two), there do not remain many large hospital sections

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or departments where patients cannot be, to a certain extent, used for teaching purposes.

Without overloading this paper with statistics and figures, we would like to say that in our 523 bed university teaching hospital, the total number of public assistance cases is never over 14%; of the semi-private ward cases we find around 34%. The balance comprises semi-private and private room cases. Between 350 and 400 one hour clinics are given during the academic year, more than half of them by the different sections of Internal Medicine. The mean average of public cases serving for this purpose is only 10%. All the rest is definitely composed of semi-private and private cases. The proportion of public cases used for teaching in the different sections in surgery is even smaller. (What John can do Jim also can!)

But it seems to us that very many other cases could (or may be should) be available for clinical teaching, even if they are at present out of reach, for the greatest part of them. And in particular, especially when we find the medical students overcrowding a few teaching hospitals, we think of the great number of non-teaching hospitals in large centres with the abundant richness of unavailable cases, and the unused clinical knowledge of some of their chiefs of services. We also think of quite a large number of scattered small hospitals where learned and experienced confrères practice medicine and surgery without anybody but their patients benefiting from their learning. True, they are doctors mainly and especially for that purpose. But some of them would accept an additional burden as others already have, even amongst their own group. We also think of the magnificent example and practical knowledge of the practice of medicine acquired by the few and lucky students who have spent some time with a general practitioner. All of that is the antithesis: it is the unavailable; we think that a good part of it could become available; we feel that it should be so, under the ægis of the Faculty.

But, since he knows so much about private and semi-private cases, the student should never forget that he now actively shares a secret, a medical secret, which ranks much higher in nature and quality. May be he is a bit prone to forget it. And in our teaching at the Faculty, we warn the medical student of the fact that where there is no necessity of talking about a case, there is no right to do so. That has much to do with the cases that can be available for clinical teaching.

In conclusion, we might say that although, in our present times, there is a remarkable limitation in the group of cases from which the clinicians used to draw for clinical teaching, fortunately the classes from which cases are still available are numerous.

The new approach, as far as success goes, is conditioned by the student's sense of responsibility even before he has sworn out the physi-

cian's oath, and by the clinician's *savoir-faire*, judgment and discretion, three qualities, which, as we all know, are an integral part of the practice of medicine.

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THE FLYING SPOT MICROSCOPE

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THIS NEW INSTRUMENT[1] designed by Professor Young and Dr. Roberts of the Department of Anatomy, University College, London, promises to be a major development in general biological research and certain aspects of laboratory medicine.

In the past little quantitative information has been derived from the standard methods of microscopy and micro-photography, but with this new scanning apparatus various particles and cells, as well as nerve or other fibres, will probably be counted and sized at a rate of a million per second. It is this possibility of quantitative analysis, apart from certain other advantages to be mentioned later, which would seem alone to warrant its consideration as a medical research tool in this coming age of mechanical counting devices. Microscopists have been content to regard the image or photograph it, for despite its theoretical possibility, few have attempted to mechanically scan the field owing to the difficulties involved of obtaining resolution by conventional lens systems.

The apparatus embodies features not found in any other form of microscope since it represents a combination of optical and electronic techniques. In brief the standard microscope is used in conjunction with the well-known technique of flying-spot scanning by two cathode-ray tube rasters locked together. The mode of scanning the object under the microscope involves the use of a minute point of light which because of its size does not continuously illuminate the whole area of the object under examination. Instead, it sweeps over successive areas of the object in a very short time period, scanning different parts at different times (Fig. 1).

This regularly moving point of light or flying-spot from which the instrument receives its name, is obtained by directing the illuminating rays through a standard microscope in a reverse direction to that normally employed. The illuminating rays in turn are obtained from the screen

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of a projection type of cathode-ray tube mounted some six to eight inches from the ocular of the microscope. This tube, provided with suitable high tension and scanning potentials, produces on its screen a single small but highly brilliant spot of light which is of constant intensity. As in television this small spot, which is about 0.25 mm. in size, is scanned into a raster of 405 lines; or to put it more simply, it is caused to sweep back and forth some thousands of times per second in an orderly pattern upon the face of the screen.

Thus the cathode-ray tube causes a small moving spot of light to play upon the ocular of the microscope. The microscope ocular and objective in turn now cause a reduction in diameter of the spot that may amount to as much as five hundred times.[2] Consequently a greatly reduced image of the moving spot, less than one micron

scanning potentials similar to those used for the first or projection tube. In brief the rasters or screen patterns of the projection and viewing cathode-ray tubes are locked together and so work synchronously.

The modulated output of the amplifier is arranged to modulate the raster of the viewing tube so that the light appearing upon its screen varies in intensity inversely as the density of adjacent parts of the object upon the microscope stage.

Although the flying spot microscope is as yet in an early stage of development, it is already evident that the combination of optical and electronic techniques affords an unusual range of control and certain advantages not possessed by any other form of microscope.

For example both the magnification and contrast of the final image may be varied by electri-
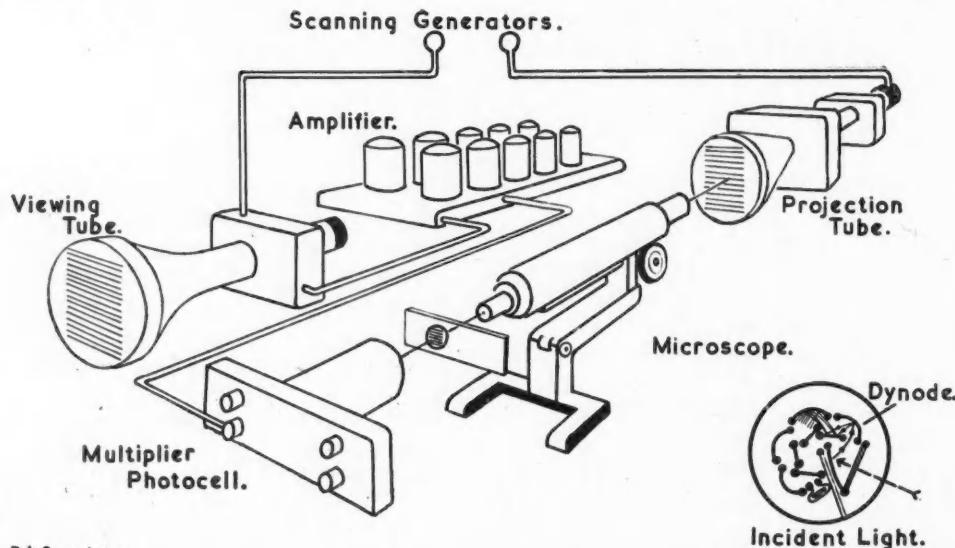
R.L. Saunders.

Fig. 1.—Principle of the flying-spot microscope (Insert, bottom right). An electron multiplier tube.

in size, is brought to play upon the specimen mounted upon the microscope stage.

This minute light spot produced at the microscope objective scans the preparation to be examined, and the amount of light transmitted to the substage condenser is accordingly determined by the density of the specimen. The movement of the spot over adjacent areas of varying density consequently causes the light entering the substage condenser to vary from instant to instant and the fluctuating light so transmitted is then picked up by a multiplier photocell.

The electrical output from the photocell is fed into an amplifier. Hence the modulation of the light beam occasioned by the varying densities of the object induces a similarly modulated current in the amplifier. The output of the amplifier in turn is used for modulating the beam current of a second cathode-ray tube of viewing type.

An image of the object on the microscope stage thus appears on the fluorescent screen of a large viewing cathode-ray tube supplied by

cal means only. The former is achieved by varying the size of the scanning raster of the projection tube, and hence the actual area scanned by the spot; the latter by simply altering the gain of the amplifier. Such control of contrast should facilitate the study of unstained or even overstained tissues. Owing to the greater efficiency of the photo-electric cell as compared with existing methods of microphotography, the instrument also lends itself to the study of living cells upon the viewing tube.

Since the brilliance of the image is directly dependent upon the viewing tube potentials and is thus independent of change in magnification, it is possible to secure large and brilliant projection displays for either research or general demonstration purposes. Moreover, a positive or negative image may be obtained by adjusting the amplifier conditions as in television. A further interesting possibility is that visible displays may be obtained by employing invisible radiation lying within a 2,000 to 10,000 A° wave-length.

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The final and outstanding advantage lies in the possibility of quantitative analysis. Various electrical techniques can be employed to analyze the photocell output and hence automatically count and size particles or cells at the incredible rate of a million per second. The application of the apparatus to various medical and scientific problems can be readily understood.

In conclusion the author would like to thank the designers for showing him the instrument, and to refer the reader to their recent article on the subject.

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THE INFLUENCE OF SODIUM CHLORIDE ON THE THYROID HYPERTROPHY PRODUCED BY AN IODINE DEFICIENT DIET IN THE MOUSE[*]

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IN RECENT YEARS, it has been felt that the production of goitre by diets low in iodine might be influenced by the composition of the diets.[1 to 4] However, by varying the components of the Steenbock-Black diet, Remington and his associates found no factor other than iodine deficiency playing a major rôle in the development of goitre in their rats.[5 to 7] Since the thyroid of the mouse is more responsive to the low iodine diet than that of the rat,[8] mice were used to re-examine the part played by each constituent of this diet in the production of thyroid hypertrophy. The only component found essential for the induction of goitre by the low iodine diet was sodium chloride.

The influence of sodium chloride was shown in three groups of 13 young C3H (Heston) male mice fed a basic low iodine diet consisting of corn meal, wheat gluten, yeast, and calcium carbonate. Supplements of sodium chloride were added to control the dietary level of this salt. The first group received none; the second or control group, 1%; and the third, 10% sodium chloride. All animals fed the low sodium chloride diet (first group) appeared healthy and gained weight at the same rate as controls, whereas among those given excess sodium

chloride (third group), 5 died. After 61 days on the diets, the mean weights of the left thyroid lobes were 4.2, 13.2, and 14.7 mgm. respectively in the three groups, in contrast to approximately 1 mgm. in mice fed the usual laboratory diet.

Histologically, the right thyroid lobes of control mice (1% sodium chloride) were highly stimulated. They showed irregular, densely cellular follicles with small lumina containing thin wisps of colloid. Thyroids in the 10% sodium chloride group had a similar microscopic appearance. The glands of the animals which received no added sodium chloride were less stimulated. They displayed smaller spherical follicles containing fewer cells and larger colloid accumulations. It was concluded that withdrawal of sodium chloride interfered with the thyroid hypertrophy produced by iodine deficiency, while excess sodium chloride (10%) did not significantly affect the enlargement of the gland.

The results were confirmed in two groups of mice fed the basic low iodine diet with 0 and 1% sodium chloride respectively. (Wheat gluten was omitted since its sodium chloride content was found to be high.) Animals of both groups survived in good health and gained weight equally during the 51-day experimental period. The large goitres characteristic of the 1% sodium chloride group (mean left thyroid lobe weight, 12.0 mgm.) were not observed when the sodium chloride supplement was withheld (mean left thyroid lobe weight, 2.3 mgm.). Further work has shown that the effect produced by sodium chloride could not be obtained when either sodium or chloride ions alone were administered.

It thus appears that an adequate supply of sodium chloride, as such, is indispensable for the development of goitrous thyroids under conditions of iodine deficiency in mice.

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ERRATUM

Registration in the United Kingdom.

The notes on medical registration in the United Kingdom (published in our October issue) should be corrected on page 377 to read, "They are intended as a guide to overseas inquirers but the Bureau does not accept any responsibility. . . ."

EDITORIAL

WHAT IS INTERNATIONAL MEDICINE?

We talk casually enough about the world becoming smaller, but for many, if not most people, that is said only in the sense of travelling. To dine in Canada and breakfast in England appears dramatic enough.

But to be introduced overnight to fresh and different medical and social conditions; to meet other nationalities; to see their methods of living, their outlook, their problems, their "struggle to escape"; all this arouses a far more penetrating sense of nearness and of community of human interests.

These are commonplaces that have always been applicable to travel of any kind: air travel has only widened our range. But they seem to gain more force in the presence of such international gatherings as the World Medical Association. At its recent meeting in Athens, the varying medical problems over a large proportion of civilization were strongly lighted up. Their solution is another matter. But there is value in bringing them forward and giving them joint consideration.

This was the Sixth Annual Meeting of the World Medical Association, and it should be possible now to measure to some extent the degree of its growth. In the nature of things it could only develop haltingly and would display many weaknesses. Perhaps a useful method of estimation would be to compare its present status with its condition for the first year or two, when the necessity for organization was peremptory. Delegate members had not then come to know each other. The scope of the objectives was not clearly defined. It may even be added that perhaps some member nations had yet to be fully convinced of the value of the Association.

At this sixth meeting much of this initial uncertainty had gone. Organization had gained headway, and we may pause to pay tribute to the incessant labours of the architects. Friendships had been established, and the whole indefinable atmosphere of a united body had begun to develop.

The W.M.A. functions very much as does any other medical organization, but one obvious difference is that it acts more as a clearing house than as a directing body. Each country decides its own policy, but in the W.M.A. there is the opportunity of learning how others deal with their own problems. More than once at this conference some country asked for the help of the W.M.A. in handling a problem, but the Association could do no more than allow for an exchange of views. This is not to say however that the expressed views of the W.M.A. would have no weight in moulding opinion.

Social security, as would be expected, was a prominent subject on the agenda. It provided an excellent opportunity for a panoramic view of conditions in many countries, from Great Britain in which the most striking advance has been made, to India where no social security exists at all. Between these two extremes there were systems of varying completeness. No other subject occupied so much of the time of the Assembly. Social security is a political concept, but its development and fulfilment are inextricably bound up with Medicine. The growth of population and the increasing complexity of our civilization inexorably compel us to think beyond the immediately technical problems of medicine. It is we who see at first hand the functioning of schemes of social security, particularly the psychological effects in removing too much of the individual's responsibility for himself. Perhaps it is not the doctor's place to work out schemes of social security, but as one who is concerned in their operation he should be consulted in their conception. He must then be ready to think out their implications.

It was with this in mind that the General Assembly of W.M.A. set down its twelve principles of social security as expressing the views of the profession on the relationship between itself and social security. These are largely a replica of our own principles as enunciated with relation to Health Insurance. They were restated at the past meeting with the recommendation that

(a) When Social Security schemes are necessary, they should be developed in the closest collaboration with the medical profession.

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(b) The fundamental aim of a Social Security scheme should be to raise the individual to a level at which he can help himself.

(c) Any Social Security scheme should contain elements that encourage self-reliance and a sense of personal responsibility.

(d) Any Social Security scheme should stress the obligation of the individual to make at least part of his contribution directly to the functioning and costs of the scheme.

The World Medical Association serves as does no other body to bring together a profession with a community of purpose but with a multitude of differing national problems. No other international body has a more disinterested purpose than has W.M.A., and none other can contribute more directly to the discussion and solution of the problems of social medicine.

A CANADIAN TEXTBOOK OF SURGERY

Medical textbooks from Canadian sources are not yet numerous and it is therefore worth drawing attention to the latest effort of this kind. This is the "Textbook of Surgery", a joint compilation prepared by the younger men of the staff of the Royal Victoria Hospital, Montreal, under the editorship of Dr. H. F. Moseley. The foreword expresses the hope that this text, based as it is on sound principles, will aid students, but the scope of the book is wide and thorough enough to serve the graduate and practitioner as well.

The illustrations are worthy of very special commendation. Colour and photography are freely used, but the line drawings are just as effective in bringing out the various points.

The book bears the authority of the surgical teaching of McGill University, and should prove a valuable addition to the teaching literature.

Editorial Comments

A CANADIAN DIABETIC ASSOCIATION

Some time ago we drew attention to the formation of the Diabetic Association of Ontario (this Journal 61: 421, 1949). We are glad now to see that steps are being taken to organize a Diabetic Association on national lines. More detail will be found in the short account on page 698. The organization of this body is still incomplete but we hope to hear more about it before long. Much valuable work can be done by such an Association, and physicians can aid greatly by advising their patients to join. Similar organizations of course exist on both sides of the Atlantic and a corresponding development in Canada will be welcomed.

MALARIA IN CANADA

With the return of service people from Korea, we see an increasing number of both primary attacks and relapses of malaria amongst them. It is possible that such persons, especially if inadequately treated, might act as a reservoir of infection for indigenous Anophelines. In view of this situation we present a short review of this subject prepared by Dr. F. O'Rourke, a physician and entomologist with the Division of Entomology, Federal Department of Agriculture.

A survey made in 1944 showed that five species of *Anopheles* occurred in Canada, *viz.* *A. quadrimaculatus*, *A. freeborni*, *A. occidentalis*, *A. punctipennis* and *A. walkeri* (Twinn, 1945). The first two species are of the greatest interest as they have been shown to have a close epidemiologic correlation with the occurrence of human malaria in the United States. *A. quadrimaculatus* occurs in the southern fringe of Quebec and in Ontario from the Ottawa valley southwards to Lake Erie. *A. freeborni* has been recorded in Canada only from British Columbia and is apparently rare there. Although *A. walkeri* has been found naturally infected and the other two species have been infected in the laboratory, they do not appear to constitute any significant danger as vectors since they have never been shown to be responsible for malaria transmission in North America.

The introduction of gametocyte carriers in any area south of the 60° F. summer isotherm gives rise to the possibility of malaria transmission if suitable vectors are present. North of the 60° F. isotherm the extrinsic incubation period (in the vector) becomes so long that the malaria parasite is unable to develop to the infective stage. In view of the known vector potentialities of those species of anophelines occurring in Canada, it would appear that the possibility of autochthonous malaria occurring is greatest in southern Quebec and Ontario. There is, however, very little chance of malaria becoming endemic again as long as present standards of living are maintained. The chance that an overwintering *A. quadrimaculatus* might spread an infection among the occupants of a dwelling is a possibility, although it is a remote one.

Physicians and Medical Officers of Health should realize that as well as the unlikely chance that a sporadic case may occur, there is very little danger of an outbreak of the disease following such a case. When, however, several cases occur in the same neighbourhood anopheline control should be undertaken if anophelines are breeding in the area. In all cases prompt and adequate treatment with radical cure is not only in the best interests of the patient but is also of major importance epidemiologically in preventing the infection of mosquitoes. A.H.N.

MEN AND BOOKS

TRENDS IN MEDICINE*

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IN MATHEMATICS we may plot curves and draw conclusions as to future events on the basis of this information. The advances in astronomy resulted from the observation of circles and ellipses. Inaccuracies were corrected by the discovery of non-Euclidean geometry and of the theory of relativity. It may not be necessary to study the whole curve but merely the curve between certain "limits" to ascertain the trend at the moment. Business makes use of the same discipline. While we cannot approach mathematical exactitude in medicine we too borrow the same terminology and attempts are made to apply statistical methods in certain branches. From these results we obtain important mortality and morbidity figures. Tonight I wish to discuss trends which cannot be expressed mathematically but which are just as significant.

To draw conclusions we should have a starting point and a base line for comparison. For the purposes of this paper I arbitrarily select Hippocrates and the classic period of Greek medicine and, for my limits, only the period of our own personal practice.

The Asclepieia were the temples dedicated to Æsculapius, the son of Apollo who was the god of healing. The most celebrated of these temples were those of Cos, Cnidus, Epidaurus and Pergamon. In many ways they were not unlike health resorts of modern times. Here the patient was received by the priest-physician, bathed in water from the local mineral spring, massaged and anointed. He then offered a sacrifice to the temple god and went to sleep. His dream was interpreted by the priest who prescribed catharsis, emesis, blood letting or whatever else he thought fit. If this treatment was successful a tablet giving the history of the case and the treatment was hung in the temple. These tablets became the permanent records of the early schools of medicine. These fragmentary case histories are sometimes supposed to have been the origin of Hippocrates' description of disease. I do not intend to enlarge on him or his writings but to refer only to his article entitled "The Law" to see what has been done in roughly 2,500 years.

Hippocrates wrote:

"Medicine is of all the Arts the most noble; but owing to the ignorance of those who practise it and of those who inconsiderately form a judgment of them, it is at present far behind all other arts. Their mistake appears to me to arise principally from this, that in the cities there is no punishment connected with the practice of medicine (and with it alone) except disgrace and that

*Read before the Harvey Club, London, Ontario, April 21, 1952.

does not hurt those who are familiar with it. Such persons are like the figures introduced in tragedies, for as they have the shape and dress and personal appearance of an actor but are not actors, so also physicians are many in title but very few in reality."

To correct this, Hippocrates introduced the oath credited to him. It was the first code of medical ethics. The physician swore to follow that system of regimen for the benefit of the patient and to abstain from whatever is deleterious and mischievous, to give no deadly medicine, not to procure an abortion, with purity and with holiness to pass his life and practise his art, to abstain from every voluntary act of mischief and corruption and to honour professional secrets. The oath not to cut for stone but to leave this to be done by men who are practitioners of this work is early recognition of specialization.

Hippocrates continued,

"Whoever is to acquire a competent knowledge of medicine ought to be possessed of the following advantages; a natural disposition; instruction; a favourable position for the study; love of labour; leisure."

He then enlarged on each point. Finally he said,

"Those things which are sacred are to be imparted only to sacred persons; and it is not lawful to impart them to the profane until they have been initiated into the mysteries of the science."

Did he predict the pre-medical course?

Here we have our base line from which progress has been made and here we have expressed for us the requisites which are just as true now as then. I have no intention of tracing the tremendous progress made throughout the centuries for that would be unnecessary and wearisome but shall proceed from this early state to conditions as they exist now.

The selection of medical students still presents a serious problem. There must be exclusion because there is not room enough for all in college. Unfortunately we can point to some of the brightest stars in medicine who would never have been permitted to shine at all under the modern system. We are familiar with the difficulties of the selection committees in judging the future progress of individual candidates. A writer in the *Journal of Medical Colleges* concluded that aptitude tests should be dropped because of the need of aptitude tests to test the aptitude testers.

By inspection of medical schools the weaker institutions have been eliminated. The rapid expansion, however, of the individual sciences creates a major difficulty in the allotment of time in the medical course. The growth of specialties creates a new need for increased clinical material. This focusses attention on the size of cities and of hospitals suitable to maintain medical schools particularly for postgraduate work.

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Present hospitals are developments of monasteries and convents, of almshouses and nursing homes. At first they were subject only to the regulations of their owners. More recently governments have issued certain additional regulations. Smaller hospitals still operate under these two authorities. As soon as a Canadian hospital wishes recognition for intern training it must meet the requirements laid down by the Canadian Medical Association. As a means of further standardization of hospitals the American College of Surgeons has undertaken surveys. This organization spends $75,000 a year in Canada and no Canadian organization has funds enough to carry on this work alone. This work will be continued by the joint effort of several associations. A few hospitals may wish to be connected with a medical school. These hospitals must then meet other standards laid down by the universities. More recently a new level has been set for senior internship and residency leading towards certification by or fellowship in the Royal College of Physicians and Surgeons of Canada. These new requirements stress the number of staff patients and this directs attention to the categorization of patients. Patients now fall into one of four classes on the single basis of their ability to pay certain rates which in turn is determined entirely by the hospital trusts. The private patient is able to pay for a private room and the semiprivate patient can pay for semiprivate accommodation. All others formerly were indigent or staff patients for whom the municipality and province were responsible. In an open hospital these could be treated by their own physician but in a closed hospital these must be assigned to staff doctors. These were the patients used for teaching purposes and the problem was quite simple.

With the increasing cost of hospitalization a new group has evolved on which in a real sense the future of medicine depends. These are the patients who can pay some but not all of the hospital expense. In some hospitals they are called "self pay" staff patients. In an open hospital there is no difficulty. The patient's own doctor treats them and collects all or part of his fee. In a closed hospital and particularly in a teaching hospital there are major problems. The standing of the hospital as a teaching or postgraduate institution depends now directly on the number of patients handled by the staff and this in turn depends in part on the number of "self pay" staff patients. This number increases as the hospital costs increase. Obviously this vitally affects the private practice of medicine. Many of the patients carry insurance for surgical benefits and sometimes for medical benefits in full or in major part but if they fall short of meeting the semiprivate hospital rate, they must accept staff accommodation and service.

This constitutes a new problem in medical economics for funds are now diverted from the purpose for which the patient and insurance

company originally intended them. Before the widespread purchase of insurance, this was not the problem that it may become. To assign this money to a Hospital Staff Fund is a compromise, probably the best that can be made, but it only helps to subsidize hospitals and universities at the expense of the private practitioner who loses the patient, the contact and the fee. These patients were thrifty and independent and thought that they were buying private services only to find this denied to them.

In a broad sense a doctor becomes a general practitioner or a specialist. Specialization is not new. It was highly developed in ancient Egypt. For many reasons it now is becoming increasingly important again.

In spite of all the fine platitudes about general practice we must face the fact that it now has no academic recognition. In medical schools and on the active staff of fully accredited hospitals there is no place for general practitioners. Quite recently in the out-patient department of a large Toronto hospital general practitioners have been replaced by internists. The recent graduate who listens to the honeyed words about the value of general practice as a training ground for future specialization will find it well-nigh impossible to re-enter the stream of special training because there will be no vacancy for him.

Pædiatrics, anæsthesia and now obstetrics are passing from the hands of the general practitioner in larger centres. His work is gradually becoming limited to medicine and simple surgery. With the introduction of newer hospital regulations major surgery will ultimately be closed to him. In small centres he will survive longer. In England doctors are proposing a College of General Practitioners to protect themselves against specialists and hospitals.

How may one become a specialist? The late Louis B. Wilson of the Mayo Foundation stated that there were three ways, (1) by a long course of special study, (2) by a short intensive course and (3) by self-proclamation. To protect the public the government has now limited the word "specialist" to those who have concluded a long course of special study and has placed the jurisdiction in the hands of the Royal College of Physicians and Surgeons of Canada.

This Act is having a profound effect on hospitals, interns and the general practice of medicine. Whether intended or not it has created monopolistic controls which may or may not be good for medicine as a whole. For simplicity we shall omit discussion of certification and refer only to Fellowship because the statement has been made that certification will gradually be eliminated and the problem is essentially the same anyway.

The Royal College specifies that the candidate must complete five years of postgraduate training in acceptable institutions and that his work must be reviewed before he is allowed to submit himself for examination. To meet these require-

ments hospitals are graded as satisfactory for junior or senior internship or for residency. An important requirement is that there shall be a certain number of staff patients. There are few hospitals with enough indigent patients and for this reason the number of "self pay" staff patients assumes tremendous importance because on the number of them depend the recognition of the hospital and the openings for prospective candidates. Working with private patients whether attended by doctors on the active or courtesy staff is no longer considered of any value in training. To be a private assistant to a Fellow of the Royal College has been acceptable but to be assistant in a hospital to several surgeons with the opportunity of seeing a greater number and variety of patients is now valueless.

If we follow this to the logical conclusion we find that only in university hospitals can a candidate receive full training. A few hospitals may receive recognition for one year's service and all other hospitals will receive no recognition.

In the United States there are 10,000 vacancies for 5,000 interns. In Canada the ratio presumably is the same. As a result of the above requirements there is a further serious dislocation of the distribution of even junior interns. Because there are so few recognized residencies an intern goes to certain hospitals in the hope, usually forlorn, that he will be the one selected for promotion. He knows that if he is not selected he will have little if any chance of completing his Fellowship in Canada. He is then forced to look to the United States or Great Britain for training. Failing this he is doomed to academic exclusion in Canada. Even if successful he will find few openings unless his training has been sponsored.

There is no quarrel with high standards. There is a quarrel with the principle of fore-ordination. If an individual is not chosen as a student or junior intern by the professor he will have little chance of attaining his fellowship.

One serious criticism is that there is less and less opportunity for the late or slow starter or for the one who may wish to change his interests later.

Hospitals may be divided into (1) those that are owned and operated by a university, (2) those in which the university controls the staff wards and appoints the active staff, (3) those with enough staff patients to be recognized for one or more years of senior training and (4) other hospitals.

I do not know of any hospital in Canada belonging to type 1. The changes that we are studying are seen best in type 2. Here we see the universities exercising their educational function but gradually assuming more control of the actual practice of medicine. Definite monopolies are developing and increasing. What is the use of training the average graduate if he is going to be excluded from the use of hospitals because rooms are preempted or because the hospital is

actually closed? The line between the privileged and the under-privileged is being more sharply drawn. In some centres it is virtually impossible for certain practitioners to admit a patient to hospital. It is obvious that this interferes with his practice and his professional development.

What effect are these changes having on internships? In large hospitals there have always been junior and senior interns and residents under the control of the hospital itself. Their function, however, is changing. A cleavage plane is now evident. The seniors and residents no longer have a responsibility to the hospital as a whole. They are now becoming graduate students under the direct jurisdiction of the chief of the service and indirectly of the university and their services are no longer available to the courtesy staff or even for private patients of some of the active staff.

Because of this serious lack of service to doctor and patient some surgeons have found it necessary to hire their own assistants to the further detriment of intern training. It has been argued that seniors and residents should be appointed for the private floors. For what purpose, when these men would receive no recognition for the time spent? It has been stated that junior interns are complaining that they do not receive as good experience in hospitals stressing senior training and yet they hesitate to go elsewhere for fear they will miss their chance for advancement.

It would appear then that we are entering the phase of fore-ordination and are turning our backs on free enterprise. In addition to what a man knows it is becoming increasingly important whom he knows. When it comes to university and hospital appointments there is less opportunity for the man who has taken his training independently. Men are chosen and places reserved. It now becomes necessary to make the contacts first and then take the training afterwards, otherwise one may find himself with extensive and expensive training and no opening.

The State is playing an increasing part in the practice of medicine, although the experience in Great Britain seems to be dampening the enthusiasm of many. The care of tuberculosis is now a government function. This seems to work smoothly. If there is dissatisfaction it certainly is not publicized. Mental cases of necessity are largely the responsibility of full-time government appointees. It is interesting, however, to note the growth recently of opportunities for psychiatrists in private practice. Anterior poliomyelitis is a provincial responsibility in Ontario or was until recently. Here we saw the curious attitude on the part of the authorities in that every one was paid except the doctor.

We are witnessing a change in the handling of cancer patients. Here again the approach may be correct but many feel that it is merely a question of developing another funnel. In the future there will be no use in studying radiothera-

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peutics unless there is an assurance of an appointment by the cancer commission. There would be no possibility of competing privately against the control of radon, the cobalt bomb, radioactive isotopes, the little Red Door and advertising by institutions and lay groups.

Lay organizations are being interested in cerebral palsy, orthopædic cases and plastic cases and are unconsciously active as funnels not only for staff cases but for diverting private cases as well. Organizations for diabetics and cardiacs are being formed and whether we like it or not will result in a further channeling of these cases.

Looking back we see that Hippocrates' problems were small. Diagnosis was primitive and treatment simple, although often drastic and with little or no scientific basis. A physician's reputation depended largely on his prognostic acumen. Hospitals, as we understand them, were non-existent.

With the growth of medicine, hospitals became necessary but at first they were for the destitute and afforded only basic general care, requiring no more than gentle hands and a sympathetic heart, although these were not always in evidence, Advances in medicine, in association with changing economic conditions, have made hospitals an absolute necessity for every doctor, not merely for simple nursing care but for the more elaborate diagnostic and therapeutic procedures. The hospital now is so important that to exclude a doctor is to deprive him of part of his means of livelihood and progress. A closed hospital for staff patients may be necessary for teaching purposes but a hospital that closes its private floors is perpetuating a monopoly for those already established and presents an unwarranted barrier to others who have earned the right to practise.

Every new hospital or addition to an old hospital increases the relative lack of interns to carry on the functions of the hospital. We are interested in the well-being of the medical organization as a whole—patients, interns, doctors, both staff and courtesy. Progress of necessity brings changes but these changes should be watched closely. Are too many interns being diverted to certain hospitals and to certain services within a hospital? Are we developing a group of haves and have-nots? Are monopolies being created?

Is specialization in danger of becoming a gift of the heads of departments? It has been said that in a few years five men will control surgery in Canada. Is the present system endangering hospital service as a whole by developing a service within a service? Is too much stress being laid on staff cases? What should be the place of the so-called "self-pay" staff patient? Is an economic factor being introduced which may prove serious to private practice? Organized medicine in Canada is against state control. Are we substituting university control?

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COLLEGE OF PHYSICIANS AND SURGEONS OF SASKATCHEWAN

The College of Physicians and Surgeons of Saskatchewan and the Saskatchewan Division of the C.M.A. held their Forty-Fifth annual meeting at the Hotel Saskatchewan in Regina on September 30, October 1, 2 and 3. The total registration this year exceeded any previous convention's experience. 274 medical men and 188 medical wives signed the register.

A pre convention group attended the Rough Riders-Eskimos game on the 29th and the informal coffee party that night.

The business and clinical meetings began on September 30, where the following speakers were heard: Dr. A. D. Kelly, Deputy General Secretary of the C.M.A.; Dr. Douglas G. Cameron of McGill; Dr. R. K. Thompson of Alberta; Dr. J. G. McCarroll of Moose Jaw; Dr. S. C. Best of Regina; Dr. H. Gordon Young of Moose Jaw; Dr. Harold Orr, President of the C.M.A.; Mr. E. C. Leslie, Q.C., of Regina; Dr. J. W. Stephen of Moose Jaw; Dr. Martin Spooner, Toronto; Dr. T. E. Hunt of Regina; Dr. T. J. Dry of Mayos; Dr. Jack F. C. Anderson of Saskatoon; Dr. J. D. Stephen of Regina; Dr. W. B. Tufts, Outlook and the Honourable T. J. Bentley, Minister of Public Health.

Both the Annual Dinner of the College and the Dinner and Dance were very successful and well attended. Of particular interest were the skits put on by the various Medical Societies in competition for the Ritchie Cup. The winners this year were the Saskatoon group.

The Ladies' Committee of the Regina Society playing a very active part this year in making the meeting so successful. This group arranged an extremely interesting program for the medical wives and as a result all those in attendance spent a more than usual enjoyable and busy time. All the credit for the entertainment of the ladies at this convention is due to the time, the effort and the organizational ability displayed by our Regina hostesses.

Annual Meeting, Manitoba Division, Canadian Medical Association

The annual meeting of Manitoba Division, Canadian Medical Association was held in the Royal Alexandra Hotel, Winnipeg, October 6 to 10 under the presidency of Dr. A. M. Goodwin. Six hundred and fifteen registered, an all-time high. At the president's dinner on October 6, Dr. Harold Orr, C.M.A. President, Dr. A. D. Kelly, Deputy General Secretary, and Dr. C. M. Spooner, Toronto, were present in addition to members of the MMA executive and other guests.

Guest speakers were Dr. Norman Miller, Ann Arbor, Mich., Professor of Obstetrics and Gynæcology, University of Michigan, Dr. John W. Scott, Edmonton, Professor of Medicine, University of Alberta, Dr. C. Martin Spooner, Clinical Teacher in Surgery, University of Toronto, Dr. Max Thorek, Chicago, and Dr. Frank B. Walsh, Baltimore, M.D., Associate Professor of Ophthalmology. Dr. Spooner and Dr. Walsh are graduates of Manitoba Medical College and revived old memories during their visit. Dr. Kelly addressed a public meeting in Grace Church October 7 on "The Price of Health".

Speakers at the luncheon meetings were Professor R. A. Wardle, Carlyle Allison, Editor of Winnipeg Tribune, and Inspector J. A. Churchman, R.C.M.P., Ottawa.

The commercial exhibitors expressed their satisfaction with the arrangements for their exhibits and with the number of visitors to the booths.

The high lights of the dinner and dance on October 10 were the two-piano duets of Dr. Ross Cooper and Dr. Carl Henneberg, the toast to the Ladies by Dr. M. T. MacFarland and the brilliant reply by his wife, a former Dean of Women at Queen's University.

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Dr. P. H. McNulty, chairman of the negotiating committee reported at the business meeting on October 9 that a new fee schedule had been approved by the Workmen's Compensation Board. Dr. C. E. Corrigan reported that about 35% of the population of Greater Winnipeg is enrolled with Manitoba Medical Service.

The election of officers resulted as follows: President—Dr. C. W. Wiebe, Winkler; First Vice-president—Dr. W. F. Tisdale, Winnipeg; Second Vice-president—Dr. R. W. Whetter, Steinbach; Honorary Secretary—Dr. F. G. Stuart, Winnipeg; Honorary Treasurer—Dr. Ruven Lyons, Winnipeg; Rural Member-at-large—Dr. A. L. Paine, Ninette; Winnipeg Member-at-large—Dr. L. A. Sigurdson.

ROSS MITCHELL

Nova Scotia Medical Society

The annual meeting of the Nova Scotia Medical Society was held at the C.P.R. Summer Hotel Lakeside Inn, Yarmouth, September 3 to 5 under the presidency of Dr. L. M. Morton. There was an exceptionally good registration and the hard work of the organizing committee was reflected in the smoothness of all the arrangements.

The clinical program consisted of eight scientific papers. The speakers and their subjects were: (1) Dr. T. A. Lebetter, Winnipeg, "The Diagnosis and Treatment for Coronary Insufficiency". (2) Dr. Wallace M. Roy, Halifax, "The Rôle of the Radiologist in Intraabdominal Disease". (3) Dr. B. F. Miller, Halifax, "Low Back Pains". (4) Dr. Roger W. Reed, Professor of Bacteriology, Dalhousie University, Halifax, on "An Outbreak of Acute Nephritis". (5) Dr. Henrich G. Brugsch, Physician-in-Charge. Arthritis Clinic, New England Medical Centre, Boston, Mass., spoke on "Rheumatoid Arthritis". (6) Dr. Walter C. MacKenzie, Professor of Surgery, University of Edmonton, Alberta, spoke on "Pancreatitis". (7) Dr. Harold Orr, Clinical Professor of Dermatology, University of Alberta, Edmonton, Alberta, spoke on "Systemic Lupus Erythematosis". (8) Dr. D. R. Wilson, Associate Professor of Medicine, University of Alberta, Edmonton, Alberta, "The Treatment of Macrocytic Anæmias,". Next year's meeting of the Nova Scotia Medical Society will be their one hundredth annual meeting and elaborate arrangements are already underway to make the anniversary one to be remembered.

The officers for the coming year were elected as follows: President—Dr. J. W. Reid; Vice-president—Dr. M. G. Tompkins; 2nd Vice-president—Dr. Hugh MacKay; Secretary—Dr. H. G. Grant; Treasurer—Dr. R. O. Jones.

C. M. HARLOW

WORLD MEDICAL ASSOCIATION

YOU ARE WELCOME

ATHAN. MANTELLOS, M.D.,*
Athens, Greece

[*We reproduce herewith the greeting of the physicians of Athens to the delegates of the World Medical Association on the occasion of its Sixth Annual Meeting in Athens October 12-17, 1952. The warmth of its sentiment was more than equalled by the generous hospitality extended to the visitors, to whom Athens will remain as a most pleasant memory.*—EDITOR.]

On behalf of the physicians of the Greek capital we extend a hearty and brotherly welcome to all the delegates and members of the Sixth General Assembly of the World Medical Association and the Third Meeting of the Medical Editors of the world.

*President of the Medical Association of Athens, Greece.

In the birthplace of Zeus Xenios, at whose altar worship has never ceased throughout the centuries—either in days of prosperity or in days of dire need—the veneration of this God is an inexhaustible treasure for our nation. Hence, usual expressions of gratitude and best wishes can not duly show the ardent emotions of the Greek medical corps for the honour that your visit has bestowed upon Greece.

It is neither the ancient glory nor the modern heroic suffering of our people that gives us such great satisfaction and pride whenever we entertain friends. Neither is it the azure sky, the gentleness of our mountains or the brilliance of the sea, that makes our contacts with foreign visitors so easy and friendly. The remnants of the masterpieces of our ancient civilization, which it is believed, incorporate the ideal link of human intelligence and inspire and charm every cultured human being throughout the world, are but a mortal radiance of the spirit of our people—a people who considers the foreigner as an honoured guest and receives him as a brother; a people who place the human being on an equal level with God, and even when he finds that this is not true is quite willing to make God in the image of man, in order to promote an understanding of Harmony in the universe and Unity between Beauty and Truth.

Greek medicine seems to be one of the most excellent expressions of such inner beauty. The Greek physician of ancient times was accorded the appreciation of a God. The Hippocratic physician became and still is the world's best example. The World Medical Association is the result of this ideal and goal. Thus, our hearts are full of gratitude in this solemn hour in which we welcome the representatives of the noblest of science and are from all the countries of the world.

Under this tradition of the past centuries and in view of our evolving social order we are gathered here to seek a happy solution of present day problems. Today we are confronted with the paradox of too many doctors on one side and too little medical care on the other. There are physicians without patients and patients without physicians. Our goal is to make the two ends meet in an efficient and harmonious combination.

In the sincere hope that under the shadow of the immortal Acropolis, the spirit of Hippocrates, and the Declaration of Geneva we shall find our way for the welfare of mankind, your Athenian colleagues welcome you in this small but sacred corner of the earth.

SPECIAL CORRESPONDENCE

The London Letter
(From our own correspondent)

THE MINISTER OF HEALTH

The present Minister of Health, Mr. Iain MacLeod, has rapidly gained a reputation for approaching the innumerable problems of the National Health Service in a business-like and non-partisan spirit. This is well exemplified in a recent speech he has made at the annual meeting of the Executive Councils' Association, which was largely devoted to the problem of improving the lot and status of general practitioners. He referred to certain trends which should be encouraged. One was fuller co-operation between the general practitioner and the local authorities' domiciliary services, which could relieve the pressure on hospital beds by ensuring that patients did not spend unnecessary time in hospital. The family doctor could become the leader of a team comprising all the services provided by the local health authority.

Another was a closer association between family doctors and the hospitals, including a doctor's contact with his own patients in hospitals. "With all the recent advances on the scientific side of medicine", he said, "hospital treatment has become so elaborate and so expensive that it is imperative to reserve it for patients who really need it. Patients ought not to be sent into hospital unless they need an investigation or other treatment

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which can be given to them only as in-patients, or their homes or other social circumstances make it essential for them to be admitted where purely medical needs may not." If these principles could be maintained, the clinical interest of general practitioners would be greatly increased.

On the question of hospital appointments for general practitioner he took a strong line. General practitioners in smaller towns and rural areas should be able to have charge of their patients who do not need specialist care but require admission to hospital, and selected general practitioners should hold various specific posts part time.

This is a constructive approach to one of the fundamental problems of the National Health Service which should go far towards restoring the self-respect of general practitioners and giving them renewed hope for their professional status in the future. If his words can be translated into deeds, he will have done much to undo the harm done by his predecessors.

ISONIAZID AND PULMONARY TUBERCULOSIS

The interim report of the tuberculosis chemotherapy trials committee of the Medical Research Council on the treatment of pulmonary tuberculosis with isoniazid has now been published. It is based upon the findings in 331 patients: 173 treated with isoniazid (200 mgm. daily), and 158 with streptomycin (1 g. daily) plus P.A.S. (20 g. daily). Cases were divided into three groups: (1) acute rapidly progressive pulmonary tuberculosis believed to be of recent origin; (2) other forms of pulmonary tuberculosis considered suitable for chemotherapy; (3) chronic forms of pulmonary tuberculosis expected to make only a limited response to streptomycin plus P.A.S. The report is based upon the findings at the end of a three-months' period. Toxicity was a relatively small problem: 107 patients had no toxic manifestations whatsoever. The side-effects which were encountered consisted of: drowsiness in 13 patients; increased deep reflexes in 23; tremor of the limbs in 21; twitching of the limbs in 2; disturbances of micturition in 3; "nervous" reaction in 4; constipation in 9; hæmoptysis in 7; and skin disorders in 4. At the end of three months there was rather more improvement in general condition in patients on isoniazid (H group) than in those treated with streptomycin plus P.A.S. (SP group). Temperature fell to normal in 67% of febrile patients in the SP group, compared with 56% in the H group. In cases with a sedimentation rate over 20 before treatment, it fell to less than 10 in 22% of the SP group and in 20% of the H group. Two-plus or 3-plus radiological improvement was noted in 29% of the SP group and in 26% of the H group. The proportion of cases becoming bacteriologically negative before the end of the second month was 26% in the SP group and 23% in the H group.

The disturbing feature of the investigation was the high incidence of bacillary resistance to isoniazid: 11% of cases at the end of the first month, 52% at the end of the second, and 71% at the end of the third month. It is also reported that lack of progress, as assessed by radiological change, was found to be related to the emergence of drug resistance. The effect upon drug resistance of combining isoniazid with streptomycin is being investigated, and preliminary observations suggest that this combination may be effective in reducing the emergence of such resistance. The conclusion reached is that "judging wholly from short-term results, isoniazid is a very effective drug in pulmonary tuberculosis, but given alone it is not more effective than streptomycin plus P.A.S.".

PHILIP MITCHINER

The death of Mr. P. H. Mitchiner, which occurred on October 15, has removed from our midst one who has been described by a fellow-surgeon as "a very great surgeon, and a loved member of our profession". To those of us who had the privilege of knowing him this is no exaggeration. He occupied a unique niche in British surgery. In the words of *The Lancet*, "few men

have had more influence on the surgery of his time than Philip Mitchiner, and he had won an almost legendary reputation as a clinical teacher". He was one of the last of a dying race in our profession—the general surgeon, and he had a unique gift for instilling the essentials of surgery into medical students. His methods might be unorthodox, his language might be Rabelaisian, and his statements might be dogmatic, but this combination meant that no dresser who had passed through his hands ever forgot the fundamental principles upon which all sound surgery is based.

Equally outstanding was his devoted service to the army medical services, and it was only fitting that he should have made history twice during the last war; first when he was promoted to the rank of major-general in 1942, the first Territorial Army Officer to hold such high rank in the 1939-45 war; and again in 1943 when he was appointed D.D.M.S. Northern Command, a senior appointment which had never before been occupied by a T.A. officer. His name in army circles was almost legendary. His unorthodoxy and bluntness of speech might on occasion be an embarrassment to his seniors and his colleagues, but his juniors all worshipped him, quickly realizing that in Philip Mitchiner they had a senior officer who was scrupulously fair, devotedly loyal and always willing to help those who sought his advice.

Whether it be in St. Thomas's Hospital, in the councils of the Royal College of Surgeons, or in the Army, he will be sadly missed, and for many years to come, whenever British surgeons meet together, the oft-told tales will be repeated of one who never spared himself, whether it was in deflating pomposity, furthering a good cause or helping those who had the privilege of serving with him. There are many who will feel that they "shall not look upon his like again".

London, November, 1952.   WILLIAM A. R. THOMSON

CORRESPONDENCE

REFUTATION OF MIS-STATEMENTS IN THE REPORT OF THE CANCER COMMITTEE

To the Editor:

The Report of the Committee on Cancer of the Canadian Medical Association, presented by the Chairman. Dr. Carleton B. Peirce, approved by the General Council of the C.M.A. and published in the *Canad. M. A. J.*, September, 1952, page 193, contains statements in need of correction. The correspondence column is not the place to deal at length with any of those mis-statements or to present again all the evidence to the contrary. It merely allows me in refuting them to point out by " " some of the errors without restating them, thus saving space, and to invite the readers of the Report to examine the evidence presented in the various notes over the past several years to which the Report refers and to draw such conclusions as the evidence warrants.

The reader would find that, at variance with the Report and with inferences that might be drawn from it, consideration has not been limited to "mortality statistics derived from death certificates" but, on the contrary, that evidence from both the clinical and pathological fields has been plentifully included. He would find that "any or all anti-cancer efforts" have not been "strongly criticized as of no use whatever" but that criticism was largely for false claims and false bases of hasty, extensive and expensive investigation and treatment continued after exposure of their fallacy. He would find that, instead of no cognizance, full "cognizance has been taken of" and, as well, due allowance made for "the undependability of diagnosis on certificates of death," and, similarly, for "the increase in facilities and knowledge for the recognition of cancer in the past few decades and the consequent shift of a proportion of diagnoses from other cate-

gories into the cancer column," and for the "increasing" and the "aging" of the population. (The use of rates instead of numbers of deaths in order to make valid comparisons of mortality in populations of different size, and the use of age (and sex) specific rates instead of total rates in order to avoid the influence of different age (and sex) distributions are so elementary in principle and so universal in practice that it is amazing that those who had to do with the Report failed, apparently, to recognize them and their function.) The reader would find that the possibility of a previous diagnosis of cancer putting into the cancer column deaths unrelated to cancer has not been neglected but that its influence on the cancer rates in other than the older age groups was appraised as of no practical significance. (Further, had this factor contributed materially to those rates, the marked declines in mortality from causes other than cancer in females under 60 years of age should have, *per se,* effected declines, admittedly small, in their recorded breast and all cancer (combined) mortality rates.) The reader would find that "survival rates," "absolute" or otherwise, on which the Report places full reliance, are of patently dubious comparability and do not provide a basis for "valid critical analysis" or "assessments of effectiveness of treatment"; that differences in "survival rates" may be and often are attributed to difference in time or type of treatment when they should be attributed to difference in selection of cases; that differences between cases are not always determinable by histopathology so that it is impossible to assure comparability of any two series; that the term "microscopically proved" lacks the finality once accorded it and does not signify the doom that was customarily associated with it; that histopathology does not reveal with certainty the biological nature of a tumour and that metastatic potentiality is not invariably determinable by microscopic examination; that histopathologic prognoses of that potentiality and of the outcome dependent on it are probabilities based on experience to be checked always by subsequent experience; that the intake of tumours (breast and uterus) for treatment in recent decades has provided material with a different distribution from that of the past and requiring new study. The reader would find also that "the comfort and usefulness of life during the survival period" have not been disregarded but repeatedly acknowledged; that the reports and their conclusions have not been based on "generalizations and statistics of dubious value" but, on the contrary, that the data have been treated with due scepticism, have been carefully checked against data of other causes and from other sources, their weaknesses emphasized and allowed for in every instance and the validity of the basis for comparison otherwise fairly established. He would not find, as either bases or conclusions, any "generalizations" that would clash with established fact from the clinical and pathological fields. (Just what "generalizations" refers to is not clear; consequently no more specific refutation is possible.)

The reader, weighing all the evidence, without bias, would find that the only logical conclusions that can be drawn from it are: first, that none of the evidence purporting to show greatly superior efficacy of early treatment in preventing death in metastasizing cancer is conclusive evidence and that some of it is fallacious; secondly, that early treatment has little if any effect in preventing such cancer mortality and that while it postpones death in cancer of some sites, it neither materially postpones nor prevents it in any appreciable proportion of breast cancers. (If the current concept that development of metastases, after spread, is independent of any specific influence of the primary tumour is correct, and there is nothing to suggest that it is not, and as in the majority of fatal cases death occurs from remote metastases without local recurrence, the eradication of the primary lesion can have no specific or material effect on the development of these metastases in the majority of cases or on the period of survival.) Whether or not early treatment prevents death in any metastasizing cancer is a question that he could not answer on the evidence now available but he would answer that the evidence shows conclusively that, if any, the number is very small in relation to the whole of breast or total cancer mortality, and not at all commensurate with the claims that have been made and are still being made for early treatment. (How else than on this conclusion can anyone explain the identical level trends of breast cancer age-specific mortality in Saskatchewan, New Brunswick, Ontario, Massachusetts, and England and Wales with the vast differences between their respective control programs?) Of course, he would conclude also that treatment can cure non-metastasizing cancer, indistinguishable microscopically from metastasizing cancer, but this contributes only a small proportion of cancer mortality and is not under discussion here.

The reader would find, too, that those conclusions reconcile and resolve, as no alternative does, the inconsistencies, contraindications and conflicting claims of radically different techniques as found in many and the same reports. (Those inconsistencies and contradictions have been noted recently by Smithers, D. W. *et al., Brit. J. Radiology,* 1952, Suppl. 4, and Smithers, D. W., *The Lancet,* Sept. 13, page 495, 1952.)

Dr. Peirce's Report is not clearly free from such confusion! For instance, it says:

"139. . . . . The consolidated figures presented in the 1950 report of the Ontario Cancer and Treatment Foundation show an increase in numbers of new cases treated over a period from 1941 to 1951, inclusive, in its several centres. Although not a complete sample from the institutions or area in which these units of the Foundation operate, *the data reflect a true percentile increase when adjusted for the increase in population* of that Province. There has not been a significant shift in the percentage of types of new cancers recorded. *These observations would suggest that the incidence of cancer is not increasing out of proportion to the numbers and age of the population,* nor in the relative frequency of certain specific types. Some of the data further, can be taken as indicating that there has been an improvement in the detection and diagnosis of cancer, with a relatively higher proportion of cancers of the breast and uterus especially observed in earlier stages of the disease.

"140. In the same period, the *adjusted death rate from cancer in that Province has remained almost absolutely static.* Therefore, a *proportionate increase in incidence of cancer diagnosed and treated but not accompanied by an increase in the mortality rate in the same (and a fairly large) population sample can only mean an improved situation,* and refutes the pessimistic attitude of futility of the essayist in that same Province to which reference has been made above." (The italics have been added for ease of reference.) Apart altogether from the fact that a trend based on "adjusted death rates" may obscure essential facts, and be misleading, and, therefore, is not an adequate or reliable basis for comparison (*Canad. J. Pub. Health,* 43: 10, 1952), I cannot be sure what proportions of inconsistency, contradiction and obscurity are compounded in the lines quoted or whether Dr. Peirce means that there has been or has not been an increase in cancer apart from that due to increase and ageing of the population. I must assume, of course, that those who accepted, approved and published the Report had no difficulty in understanding or accepting these, to me, conflicting statements. Else how could they have been approved and published? The term "essayist," its reference obvious, is most inappropriate and must be repudiated.

Any substantial evidence that the conclusions as noted here but distorted in the Report are invalid would be a real contribution to Medicine. But neither opinions, nor beliefs, nor statements lacking a factual basis constitute substantial evidence. In the years that have passed since the publication of the first note indicating inability to control breast cancer mortality by early treatment (in succeeding notes, wider sources of data, clinical and pathological as well as statistical, have merely expanded and consistently confirmed the tentative conclusions drawn in the first), no substantial refutation has been

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forthcoming. There has, however, been a very noticeable and gratifying change, not necessarily and certainly not all as a consequence of those notes, in much of the "anti-cancer" advertising, publicity and promotional propaganda and even in cancer literature. But there is still urgent need for improvement as evidenced by this Report, by "the issue of the *Ontario Medical Review* devoted to cancer during the past year," and by other material from the Canadian Medical Association meeting, various public health departments, federal and provincial, medical schools and elsewhere, much of which still finds its way into the public press.

It is, of course, clear that Dr. Peirce is not alone responsible for broadcasting the mis-statements and implications here refuted. Responsibility for their formulation must be shared by the members of his Committee and by others who may have assisted; responsibility for their approval must be shared by the Executive, the General Council and the Secretariat of the Canadian Medical Association; and, for their publication, by the Editor of the Journal as well.

All of which is respectfully submitted.

N. E. McKINNON

OBITUARIES

DR. ROBERT T. ATKINSON, of Saskatoon, Sask., died on September 13, a victim of poliomyelitis. Born in Rainy River, Ontario in 1910, he was educated at Victoria School and Nutana Collegiate, Saskatoon, he later studied at the University of Saskatchewan and the University of Manitoba, where he graduated in medicine. Dr. Atkinson is survived by his widow and two children.

DR. CHARLES DE BLOIS died suddenly on Ocober 9, minutes after being fêted on his 60th anniversary in the profession. He would have been 85 on November 1. The veteran physician studied medicine at Laval University, Quebec, and completed his studies in France and other parts of Europe. In 1896, he opened a private hospital where the chateau bearing his name now stands. In 1908, when fire destroyed most of Three Rivers, he turned the hospital into an emergency reception centre and city officials later asked him to use the hospital building as a hostel for travellers. He later enlarged the building, one of this city's major landmarks, and called it "Chateau de Blois" after France's famed chateau of the same name after which it was modelled. He is survived by six children.

LE DR ERNEST BRUNELLE est décédé le 14 septembre à Beloeil à l'âge de 83 ans. Né à Beloeil le 12 novembre 1869, il fit son cours classique au séminaire de St-Hyacinthe et ses études médicales à l'Université Laval de Montréal où il fut reçu avec très grande distinction en 1895. Il s'établit ensuite à Beloeil où il n'a pas cessé depuis lors d'exercer sa profession.

Soucieux d'assurer le progrès de Beloeil, il a pris une part active aux affaires municipales et scolaires de sa ville dont il a été commissaire d'école, échevin, puis maire pendant plusieurs années. Lui survivent son épouse, 3 fils et 2 filles.

DR. JOHN HENRY BULL, aged 67, died on September 17 at the White Manor Nursing Home near Owen Sound. For many years a practising physician in Holland Centre, Ont., Dr. Bull fell in May and broke his hip. He had been bedfast since. Born at Weston, Dr. Bull was a gold medallist while attending university. He came to Holland Centre shortly after graduating and had practised here since. His wife died a month ago. Surviving are four sons,

DR. GEORGE L. CRANE, Liberal member of the legislature for Weyburn from 1938 to 1942, died on September 8, in a Regina Hospital. He had been chief pensions examiner for the department of veterans' affairs in Regina since 1948. Dr. Crane was born in Wisconsin. He enlisted with the Princess Patricias at Regina for service in the First World War. He was wounded in 1917 and returned to Canada. He studied medicine at Manitoba university, graduated in 1923 and beginning practice at Plenty, Sask. Later he went to Colgate and then to Radville. He enlisted in the R.C.A.M.C. in 1942, serving in Canada and retiring in 1945 with the rank of major.

He is survived by his widow, one son and two daughters.

DR. GEORGE KIDD, Trenton, Ont., died at Trenton Memorial Hospital on September 7, in his 69th year. He was a graduate of Varsity in 1909 in medicine. He interned at Grace Hospital, and joined the staff of the Ontario Hospital, Toronto. From there, he was on the staff of the Brockville, Kingston and Cobourg institutions. Then he was appointed superintendent of the Ontario Hospital, Penetang, and later Superintendent of the Ontario Hospital, Cobourg.

Dr. Kidd is survived by his widow, four daughters and one son.

DR. DAVID STANLEY LIKELY, died on September 11 in New York. He was born in Saint John, N.B. and received his early education here. He attended Mount Allison Academy and graduated with a B.A. from Mount Allison University in 1901. He graduated in medicine from McGill University in Montreal in 1905, later interning at City Hospital in New York. From 1943 to 1946 he was associate medical professor, New York Medical College. He was a fellow of the American College of Physicians, a member of the Phi Delta Theta fraternity and a past president of the Canadian Club of New York City. In May Dr. Likely received the honorary degree of doctor of laws from Mount Allison. Surviving are his widow, two daughters and a son.

DR. GARRETSON LINSCOTT, aged 70, died on October 5 at the Toronto Western Hospital. For the past 10 years he had been in poor health. Dr. Linscott was born in Brantford and was a graduate of the University of Toronto in medicine. He established a practice in Toronto in 1911. Dr. Linscott served for some years on the staff of the Toronto Western Hospital. He was a member of Howard Park United Church. He leaves his widow and two sons.

DR. JOSEPH CLAUDE ARTHUR MARCHAND, of Ottawa, Ont., died on September 13 following a short illness. He was 44. Dr. Marchand was born in Montreal and was a graduate of the University of Montreal. He did postgraduate work in orthopædics with Dr. Edouard Samson, and was later named a Fellow in Orthopædics of the Royal College of Surgeons. From 1935 to 1946 he served in England and India with the Imperial Army with the rank of lieutenant-colonel. Returning to Montreal in 1946. In August, 1950, he was appointed to the medical staff at the Ottawa General Hospital, and to the Faculty of Medicine at the University of Ottawa. Surviving are his widow and two sons.

DR. REGINALD ERIC McMULLEN, aged 52, died in the Oshawa General Hospital on September 30. He had been in poor health for the past year. A doctor in Oshawa, Ont. for the past 25 years, Dr. McMullen was a graduate of the faculty of medicine of the University of Toronto in 1926. He took postgraduate work in anæsthesia at the Toronto Western Hospital, the Lying-In Hospital in New York City, the McKesson School of Anæsthesia in Toledo, Ohio. He leaves his widow, a daughter, and a son.

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DR. J. B. MILLER, aged 52, of Walkerton, Ont., died on August 31. Born at Niagara-on-the-Lake and a graduate in medicine from the University of Toronto in 1930. Dr. Miller practised first at Mildmay. Last year he disposed of his practice, moved to Walkerton and took a special course in public health at Toronto University. While studying, he contracted pneumonia, from which he never fully recovered. He is survived by his widow, one young son and two daughters.

DR. GEORGE ARTHUR RACINE, former physician-surgeon and professor at Laval University, died in Quebec City on September 28, at the age of 65. He was born in St. Sauveur, Quebec, and studied at the Christian Brothers School in Hull, and then at the Ste. Therese Seminary and at universities both in Ottawa and Quebec where he received a doctor's degree, at the age of 21 years. Dr. Racine was associated with the Hotel Dieu Hospital since 1917 and in 1927 he became physiology professor at Laval University, and president of the Medical Society of St. Sauveur. In 1934 he was appointed cardiological specialist for the Department of National Defence. Surviving are his widow, one daughter and three sons.

DR. CHARLES F. RILEY, died in St. Michael's Hospital on September 20. He was in his 69th year. Born in St. Mary's, Ont., he attended the University of Western Ontario. In 1910, he graduated in medicine, and did postgraduate work in surgery at St. Luke's Hospital, New York, and in Edinburgh, Scotland. He then came to Toronto to practice. Dr. Riley was on the staff of St. Michael's Hospital for several years and was medical examiner for the Metropolitan Life Insurance Co. At the time of his death, he was connected with St. Mary's Hospital and the House of Providence, and was doctor for the Independent Order of Foresters, the Catholic Order of Foresters, and the Knights of Columbus. He is survived by his widow, four daughters and two sons.

LE DR THEODE SAINT-MARTIN est mort subitement, le 21 sepembre, à l'âge je 64 ans. Né à Montréal en juin 1888, il avait obtenu son doctorat au médecine en 1912. Il fit tout d'abord de l'nternat aux hôpitaux Hôtel-Dieu, Notre-Dame et S.-Paul. Après un an de pratique générale à Dorval, il dirigea une pharmacie à Montréal jusqu'en 1922. Après cette date, il se consacra entièrement à l'hygiène publique au service du ministère de la santé de la province de Québec. Il laisse sa femme, née Montbriand (Imelda); un fils et deux filles.

DR. ARTHUR ROBERT TAYLOR, who will be remembered by older Winnipeg residents and by veterans of the First World War, died in Shaughnessy Military Hospital, Vancouver, on October 16. He was buried in Winnipeg on October 20. Born in Winnipeg, 74 years ago, he graduated from Manitoba Medical College in 1900 and took postgraduate work in Edinburgh. In 1915 he became M.O. of the 5th artillery brigade and in 1918 was appointed medical director of Deer Lodge Hospital where he served until his retirement in 1943. He was a past master of St. Johns Lodge A.F. & A.M., and a member of the Scottish Rite. He is survived by three brothers and four sisters.

LE DR J.-ALPHONSE TREMPE, est décédé récemment à l'âge de 80 ans. Né à Berthierville il avait fait ses études classiques au collège de Sainte-Marie et au séminaire de Joliette. Admis à la profession médicale en 1890, il pratiqua tout d'abord à Contrecœur pendant 5 ans, puis vint à Montréal il continua de pratiquer. Gouverneur à vie de l'hôpital Notre-Dame, il s'intéressa aussi à plusieurs sociétés mutuelles. Il laisse une fille adoptive.

ABSTRACTS *from current literature*

MEDICINE

The Functions of the Forensic Science Laboratory in Criminal Investigations.

HOLDEN, H. S.: THE MEDICO-LEGAL J., 20: 20, 1952.

All effective criminal investigation is dependent on the intelligent police officer and in nine-tenths of cases he may satisfactorily conclude his case without help from other sources. In the tenth case science may be necessary, particularly so in violence, sexual cases, and road accidents involving injury. The work of the non-medical expert is complementary to that of the pathologist. A detailed study of the scene and of clothing, weapons, and other details which may serve to connect a suspect with the crime are the province of the pathologist and close liaison between the pathologist and police officer is essential. The help the investigating officer can anticipate from the laboratory falls into one of four main categories, or a combination of these, namely: to supply one or more missing links in a chain of evidence; to strengthen a weak link, or links, in a chain of evidence; to check the accuracy or otherwise of statements made either by a suspect or by material witnesses; and to assist in the rapid clearing up of routine enquiries. Three cases presented show the diversity of application of forensic medicine, such laboratory evidence may prove the innocence or guilt of a suspect. Cross examination by the defending counsel or solicitor, since his client's interests are paramount, may on occasion be severe, but with experimental and laboratory evidence at hand the expert witness should not be confused or swayed.

J. A. STEWART DORRANCE

Auscultation in the Diagnosis of Compression of the Subclavian Artery.

EDWARDS, E. A. AND LEVINE, H. D.: NEW ENGLAND J. MED., 247: 79, 1952.

Compression of the subclavian artery is an essential aspect of the pathology of cervical rib, the scalenus syndrome and anomalies of the first rib, and is diagnosed by palpation of the radial pulse on the affected side, with or without resort to the so-called scalenus manœuvre (tilting of the patient's head backward and to the side opposite the arm being tested along with depression of the shoulder of the affected side by the examiner's hand). Complete or partial obliteration of the radial pulse indicates subclavian artery compression but a more delicate test, which may be positive when palpation shows no abnormality of radial artery pulsation, is the presence of a systolic murmur heard over the distal segment of the subclavian artery. This murmur may be constant or may be brought out only by the scalenus manœuvre. Transmitted cardiac murmurs and murmurs caused by intrinsic disease such as arteriosclerosis or aneurysm must be ruled out.　　NORMAN S. SKINNER

Serial Courses of Corticotrophin or Cortisone in Chronic Bronchial Asthma.

McCOMBS, R. P.: NEW ENGLAND J. MED., 247: 1, 1952.

A single course of therapy with ACTH or cortisone may give relief from the signs and symptoms of bronchial asthma for periods ranging from weeks to months. Relapse is the rule and the present study concerns itself with an analysis of the clinical course in five asthmatic patients receiving repeated courses of such treatment (13 to 23) over varying periods (12 to 23 months). All five patients suffered from severe asthma which was refractory to conventional forms of treatment. In all five patients sufficient dosage of either hormone if given soon after recurrence of asthmatic symptoms, prevented

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incapacitation and restored an asymptomatic state. The duration of the remissions, however, was short, necessitating retreatment on the average of once a month or less.

ACTH was more effective than was cortisone and a long-acting preparation of ACTH in gelatine gave the best results and required the smallest dosage. Side-effects from the use of these hormonal preparations was minimal with this intermittent type of therapy, which is considered practical from both the medical and economic points of view in selected cases.

NORMAN S. SKINNER

The Prevention of Thromboembolism in Acute Coronary-Artery Disease.

LITTMAN, D.: NEW ENGLAND J. MED., 247: 205, 1952.

As a result of an investigation of 156 patients who survived for forty-eight hours after acute myocardial infarction it is the author's opinion that only about one in four of such patients require medicinal prophylaxis for thromboembolism. Of this group 112 (71.8%) were not given anticoagulants and only five died.

Early ambulation is important in the treatment of acute myocardial infarction and can be started in the majority of cases by the second or third week. All such patients should be encouraged to move about in bed from the start and to feed, wash and shave themselves.

Anticoagulant therapy, in the treatment of myocardial infarction, should be reserved for those patients with evidence of extensive disease (congestive failure, prolonged shock, intractable pain or high fever). All other patients with acute myocardial infarction are adequately protected from thromboembolism if they move about freely in bed, are not allowed to lie quietly for long periods and begin ambulation early.

NORMAN S. SKINNER

SURGERY

Dupuytren's Contracture.

TANZER, R. C.: NEW ENGLAND J. MED., 246: 807, 1952.

Dupuytren's contracture is a hereditary disease of males, affecting between 1 and 2%. Its etiology is obscure, as is its relation to a similar affection of the plantar aponeurosis and to induratio plastica penis (Peyronie's disease), and its frequent association with epilepsy.

The author presents an excellent review of the pathology and treatment of the condition and stresses the need of a thorough resection of the involved aponeurosis if good results are to be obtained. As a technical refinement in the surgical repair he advocates the use of a "compression suture" to eliminate postoperative bogginess a d hæmatoma of the palm, a frequent and troublesome complication which is prone to markedly delay convalescence. The "compression suture" pulls the palmar dressing down into the cup of the hand and is composed of two mattress sutures of No. 3-0 silk, double-armed on straight needles and incorporating a button which are passed directly through the hand prior to closure of the skin incisions. One needle is passed through the space between the second and third metacarpals to one side of the neurovascular bundle and distal to the deep volar arch and ulnar nerve. The second needle is similarly placed between the fourth and fifth metacarpal bones. Comparison of two groups of cases showed a much prompter return of function in those cases where the so-called "compression suture" was employed.

NORMAN S. SKINNER

Primary Carcinoma of the Third Part of the Duodenum.

ROGERS, K. E., GOLIGHER, J. C. AND WILLIAMS, E. R.: BRIT. J. SURG., 40: 1, 1952.

Carcinoma of the Duodenum.

LUNN, G. M.: Ibid., 40: 5, 1952.

Carcinoma of the Third Part of the Duodenum.

DUNHILL, SIR T.: Ibid., 40: 13, 1952.

Three papers in one issue of the British Journal of Surgery on a lesion usually dismissed as so rare as not to deserve discussion, draws attention to its occurrence in 0.035% of autopsies and 0.3% of gastrointestinal carcinoma and forming nearly half of small intestine carcinomas. The three papers report ten carcinomas of the duodenum and cover the diagnosis and treatment thoroughly. The filling defect of the third part of the duodenum is missed by the radiologist unless he is conscious of the possibility, for the barium-filled stomach overlies it. Yet it seems that metastases are usually late and surgical removal gives promise of a high survival rate. Methods of dealing with the difficulties in this region are discussed and several case reports are given in detail.

References to the handling of this lesion by several great surgeons of the past again emphasize their ingenuity and skill in blazing paths for their successors.

BURNS PLEWES

PÆDIATRICS

Foot Problems in Children.

LINDSAY, D. T.: POST.-GRAD., MED., 12: 177, 1952.

The majority of foot problems in children may be managed by the family physician. The transverse and longitudinal arches of the foot are present in soft cartilaginous and ligamentous structures. The foot may easily be moulded by external forces at an early age. In the absence of normal tonus of the anterior and posterior tibial muscles the "sling" action of their tendons is lost. Any musculoskeletal or neurologic imbalance which allows function of the foot or lower extremity in an abnormal attitude will lead to progressive deformity during the period of growth of the child. Chronic illness, hereditary patterns, malnutrition, or vitamin deficiencies all result in early and rapid changes in the shape and pattern of the foot. A very careful and detailed history is the first step—children may often mimic the gait of a friend or older person. At the examination all the clothing should be removed and the child examined while standing and while walking. The distance between the distal medial malleoli should be noted as well as the soles of the feet for flatfoot. The boot soles should be very carefully noted for the areas of rubbing and scuffing. It should be ascertained whether the mother is displeased with the child's gait and/or posture, or whether the child has a definite limp or impediment in gait with limitation of activities. A child with mildly pronated feet (flatfoot) may be corrected with guided "supination exercises" and walking on the lateral aspects of his long arches—ding-toe gait. Treatment depends upon the severity of the condition. Untreated flatfoot will not improve by growth alone. The majority of children with simple pronation of the foot are able to form a perfectly normal appearing arch when they flex the toes and when walking on the lateral borders of the feet (walking like a cowboy). This is often done spontaneously and causes relief from the ligamentous strain imposed by walking without using the muscles may help to hold up the arch, (a peg-leg type of gait or "flatfoot shuffle"). The shoes should not be too large as support from high tops is very very important. The parents should examine the shoes carefully for proper size, rather than follow the advice of a salesman regarding size of shoe and growth of the child.

J. A. STEWART DORRANCE

Methods of Assessing Therapy in Chorea with Special Reference to the Use of ACTH.

DIXON, A. ST. J. AND BYWATERS, E. G. L.: ARCH. DIS. CHILD., 27: 161, 1952.

Like other manifestations of the rheumatic state chorea is subject to spontaneous remissions and exacerbations, these factors make the assessment of the action of any particular therapy notoriously difficult. The authors graded choreic states with special attention to movement of outstretched hands, steadiness of grip, speech and emotional lability. A standard peg-board with 100 small pegs was used. The time taken by the patient to fit the pegs into the board is used as an index of the severity of chorea. An arbitrary upper limit of normal of 4 minutes has been accepted. The choreiform movements are recorded by placing the patients on an air mattress connected to a tambour and recording pen—the kinetic bed. Non-choreic children, even if active, rarely score more than 20 (day) and 5 (night). Choreic children may record 300 (day) and 60 (night). The kinetic bed score records all movements, both voluntary and choreic.

It is not possible to conclude that ACTH or any other drug is the cause of a decrease in chorea since chorea is a disease which can improve spontaneously, unless the natural recovery rate is lower than the treated recovery rate. The doses of ACTH used were as great as, or greater than, those which in the authors' previous use had produced rapid improvement in other manifestations of the rheumatic state. ACTH in this dosage does not benefit Sydenham's chorea.

J. A. STEWART DORRANCE

Factors Influencing Lactation: Part I. Maternal.

MILLER, R. A.: ARCH. DIS. CHILDHOOD, 27: 187, 1952.

A series of investigations on the incidence and duration of breast-feeding were made on women who were treated both as in-patients and as out-patients. Elderly women gave complementary or artificial feeds more frequently to their infants than younger women in the first 2 weeks of the puerperium; those giving complementary feeds usually stopped breast-feeding within a month of parturition, while those giving entirely breast feeds lactated adequately in 50% of cases for 6 months. This applied to both young and old mothers.

In the first 2 weeks of the puerperium more pre-eclamptic women required to give their infants complementary feeds and artificial feeds than did the control group. Those giving complementary feeds usually failed to breast-feed within a month of parturition, while 50% of those entirely breast-feeding lactated adequately for 6 months. This applied to both the pre-eclamptic and control group of women. The greater difficulty in breast-feeding in pre-eclamptic women was attributed to the mother's illness and to the higher incidence of prematurity in such women.

Impaired lactation due to age of small stature or pre-eclamptic toxæmia accounted for a very small proportion of women who prematurely wean their infants.

J. A. STEWART DORRANCE

Values for Fæcal Urobilinogen in Childhood.

MILLS, S. D. AND MASON, H. L.: AM. J. DIS. CHILD., 84: 322, 1952.

The values for fecal urobilinogen were determined in a series of 73 children who did not have hæmolytic disease and who were used as controls, and in a series of 20 children who had hæmolytic disease. The daily mean values, distributed according to age groups, for the controls and for those with hæmolytic disease, respectively were: under 1 year of age, 3.8 and 15.1 mgm.; ages through 1 to 4 years, 10.9 and 218.5 mgm.; ages 5 through 9 years 24.4 and 331.7 mgm.; and ages 10 through 14 years, 45.2 and 205.0 mgm. Thus it may be

seen that the mean values for fecal urobilinogen tend to increase with age, and that they are greater, at any given age, in children with hæmolytic disease than in normal children. It is concluded by the authors that determination of the value for fecal urobilinogen offers a practicable means of demonstrating abnormal hæmolytic activity in children. J. A. STEWART DORRANCE

GYNÆCOLOGY AND OBSTETRICS

The End-Results in Primary Sterility.

BENDER, S.: BRIT. M. J., 2: 409, 1952.

Sterility should be regarded as a legitimate complaint when no pregnancy occurs within one year of uncontracepted married life. The overall conception rate in 700 couples seen on account of primary sterility was 46.3%, so far as could be ascertained by a limited follow-up. If all the women had been followed to the menopause the actual rate would probably have exceeded 50%. In only one-half of the successes at the very most does it seem reasonable to ascribe the conception to medical treatment, the remainder being due to time and chance. The high rate of spontaneous cure should be borne in mind when evaluating the results of any form of treatment. Among the women previously sterile who became pregnant the abortion rate was double that given for spontaneous abortion; the ectopic rate was also significantly increased.

The incidence of congenital malformations in fetuses of more than 28 weeks' maturity was not increased, but the high abortion rate might be due to fetal abnormalities. ROSS MITCHELL

Attempt to Prevent Erythroblastosis Fetalis by Use of Cortisone During Pregnancy.

ANDERSON, J. R., BARR, G. M. AND SLESSOR, A.: BRIT. M. J., 2: 542, 1952.

An Rh-negative woman whose previous infant 2½ years ago had died of erythroblastosis fetalis was treated with 100 mgm. of cortisone daily by mouth from 34th to 37th week of pregnancy, when labour was induced. No harmful effect of cortisone therapy was observed in the mother. High-titre incomplete anti-D was present in the maternal serum throughout pregnancy. The infant was mildly affected by erythroblastosis fetalis, and has remained well following an exchange transfusion.

The result is encouraging enough to warrant further trials of cortisone therapy. The criteria useful in choosing suitable cases, and dosage and duration of such therapy are discussed. The precautions taken to safeguard the mother from possible ill-effects of cortisone are presented in detail. ROSS MITCHELL

ANÆSTHESIA

Thiopentone Followed by Nitrous Oxide and Oxygen for Anæsthetizing Outpatients.

FRANKS, E. H.: LANCET, 2: 466, 1952.

This article deals with the advantages of combining thiopentone (sodium pentothal) solution with nitrous oxide for better anæsthesia in outpatient surgery. Nitrous oxide alone without supplement has been often associated with varying degrees of anoxia when administered to patients of this category who are usually ill prepared to receive any type of general anæsthetic. By combining small "sleep-doses" of pentothal (2 to 5 c.c. of the 5% solution) with nitrous oxide and oxygen it is possible to employ an average concentration of 19% oxygen in the anæsthetic mixture. No morphine is administered preoperatively but atropine gr. 100 is used in all cases to prevent excess salivation and to reduce the pentothal-irritability of the larynx.

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The technique consists of administering the small dose of pentothal (2 to 5 c.c. of a 5% solution) *rapidly* after a test dose of 0.5 c.c. to determine hypersensitivity or extra-venous or intra-arterial injection. If the patient complains of pain following this test dose the position of the needle is altered and a successful venipuncture accomplished. Then the balance of the dose is administered rapidly to bring the patient into a condition of light sleep. The amount used is of course insufficient for surgery and requires the addition of a mixture of nitrous oxide and oxygen usually in the proportion of 79% nitrous oxide and 19% oxygen.

Recovery is rapid and consciousness is usually regained within a minute although the patient may remain somewhat drowsy for a little longer period. There appears to be little tendency to fall asleep again unless the dose of pentothal has been excessive. Nausea and vomiting are uncommon. Most patients are able to leave the hospital in about half an hour by public transport, often unaccompanied. (Abstractor's Note—The advisability of allowing any patient who has received an intravenous barbiturate, however little, to encounter the hazards of traffic unaccompanied is very questionable.)

The author reports the successful employment of this technique in more than two hundred adult patients and has collected statistics in the last 100 of these. Of these 100 patients, 14 were classified as frail, 71 as average, and 15 as resistant. The average time to leave hospital was 28½ minutes, with a range of 15 to 50 minutes. The average dose of pentothal was 3.75 c.c. of the 5% solution, with a range of 1.5 to 7.0 c.c. Operative conditions were excellent in most cases and satisfactory even in resistant patients. F. ARTHUR H. WILKINSON

DERMATOLOGY

On the Treatment of Anogenital Pruritus.

SWEET, R. D.: LANCET, 263: 258, 1952.

To the reviewer this article appears to be the most rational and best-balanced contribution to this much-vexed subject that he has encountered for many years. The author considers this disorder essentially to be "instances of lichen simplex chronicus occurring in special areas", more distressing than this complaint in other areas by reason of the differing quality of the type of sensation arising from the anogenital area. While giving due weight to psychogenic considerations, he believes it "unnecessary to endow irritation from this part of the body-surface with greater significance of psychiatric disturbance than when it occurs elsewhere". Whatever the initiating cause, sexual frustration, diabetes or pin-worms, ano-genital pruritus apparently becomes self-perpetuating even long after cessation of its original cause. The immediate agency of this self-perpetuation is scratching, and treatment must be directed to help the patient to avoid scratching. This the author attempts, and apparently with a high degree of success, by nocturnal sedation, local use of tar, mild local anæsthetics such as "Anthisan" in the day-time (warning against the use of benzocaine preparations, which are so popular and have high sensitizing proclivities) and very judicious use of roentgen therapy, which should be administered by the dermatologist.

As the result of fear of infection, or malignancy, and sense of shame, the patient develops a neurosis. Sargent (1951) is quoted as pointing out the too common error of regarding components in physical illness as necessarily being the cause of the illness. Those who become neurotic about their disability are the group most often seen by psychiatrists. Psychiatric treatment to the extent of restoring sleep, removing fears of infection, and explaining the nature of the complaint, so as to give the patient some insight ("if there is no more scratching the skin will get better by itself"), and enable him or her to help himself or herself, and be helped, is often adequate.

Periods of stress or worry often play a part in initiating or perpetuating itching, but their coexistence does not necessarily imply cause and effect.

D. E. H. CLEVELAND

THERAPEUTICS

Effects of Prolonged High Dosage with Ascorbic Acid.

LOWRY, O. H., BESSEY, O. A. AND BURCH, H. B.: PROC. SOC. EXPER. BIOL. MED., 80: 361, 1952.

In recent years large doses of ascorbic acid have been prescribed in the treatment of a variety of diseases. It has been generally assumed that daily doses of 1 gram are innocuous. In this series one woman and three men were given 1,000 mgm. per day for three months, and measurements were made of the ascorbic acid concentration in the serum, white blood cells plus platelets, the ascorbic acid tolerance curve and the urinary output of the vitamin.

The results showed uniformly and clearly that there was no abnormal change in any of these measurements, and the authors believe that prolonged high dosages of ascorbic acid have no qualitative or quantitative effect on the disposal of excess acid by the body. In these four subjects no harmful effects of any kind could be detected during the three months on 1,000 mgm. daily.

B. L. FRANK

Cortisone Treatment in Essential Dysmenorrhœa.

SCHUCK, F.: NEW YORK STATE J. MED., 52: 1316, 1952.

Fifty patients, between the ages of 17 and 21 years, free from any complaint other than "essential" dysmenorrhœa, were treated with cortisone. The best results were obtained when 100 mgm. by mouth were given initially, followed by two doses of 50 or 75 mgm. each, given during the first two days at intervals of from two to six hours, *i.e.*, a maximum of 225 mgm. per patient.

Treatment was effective when cortisone was given at the onset of pain or not more than two hours before the expected pain. When given a day or several hours before the onset of menstruation, cortisone had no effect upon menstrual pain; in other words, cortisone does not afford "prevention" when taken several hours before menstruation.

Undesirable effects were not observed in this series. There were no complaints about discomfort caused by cortisone, which provided complete relief from pain except in a few cases. B. L. FRANK

Therapeutic Studies in Hyperthyroidism: Methylthiouracil.

STIRRETT, R. L., PETIT, D. W. AND STARR, P.: J. CLIN. ENDOCRINOL. METAB., 12: 719, 1952.

Methylthiouracil was administered to a group of seventy hyperthyroid patients. Although it was planned to extend the period of treatment over twelve months in order to determine the incidence of remission after cessation of therapy, in only twenty-two of the patients could treatment be kept up for that length of time. Clinical control was achieved in all twenty-two patients on an average six weeks after starting treatment. In thirteen (60%) of these a relapse occurred within six months after cessation of therapy.

In order to achieve better results it was felt that the drug should be continued for longer until some sort of "exhaustion atrophy" of the thyroid takes place.

Among the toxic reactions encountered the incidence of jaundice associated with hepatitis (3 cases) was considered significant. Leukopenia and agranulocytosis were not met with in this series. B. L. FRANK

A Method of Decreasing Penicillin Sensitivity.

MASLANSKY, L. AND SANGER, M. D.: ANTI-BIOTICS AND CHEMOTHERAPY, 2: 385, 1952.

A group of 897 unselected patients were given a total of 1,055 injections of penicillin and chlor-trimeton maleate, a soluble antihistamine, prior to dental surgery or in the treatment of respiratory infections. Of these, 386 patients had had no previous treatment with penicillin; 482 had had one or more previous injections of penicillin, and 29 had been treated with either ointments or troches containing penicillin. The second group were 11 patients especially selected for their known sensitivity to penicillin, manifested by severe local and/or systemic reactions following previous injections of aqueous procaine penicillin.

Each patient in the first group received a mixture of 10 mgm. chlor-trimeton maleate and 400,000 units of aqueous procaine penicillin. Only one patient showed a delayed urticarial reaction eight days following the first injection. In the second group of penicillin-sensitive patients, each received an injection of a mixture containing 20 mgm. chlor-trimeton maleate and 600,000 units aqueous procaine penicillin. Two reactions were observed in this group: one of anal pruritus and the other an urticarial reaction, which was readily controlled by the administration of chlor-trimeton maleate intramuscularly and orally at four hourly intervals.

B. L. FRANK

INDUSTRIAL MEDICINE

Lead Poisoning in Young Children.

WILLIAMS, H. H., KAPLAN, E., COUCHMAN, C. E. AND SAYERS, R. R.: PUBLIC HEALTH REPORTS, 67: 230, 1952.

That lead poisoning in young children, caused by eating lead-containing paint, is one of the most common causes of child mortality due to poisoning, is indicated by this article. After explaining the significance of pica as the forerunner of this poisoning when it occurs in children, the authors outline the diagnosis, prognosis and sequelæ of the disease. Details are given re the experience in the city of Baltimore where the rate of incidence is high. Here it occurs in children of teething age living in old, run-down rented properties where lead paint had been used indoors for many years. In 1932 the Health Department in that city began studies of non-industrial lead poisoning in children. Since that time public health education coupled with a "lead consciousness" on the part of physicians and the pædiatric clinics of local hospitals, and with a blood-lead laboratory service offered by the city health department has resulted in a marked increase in case recognition.

For a number of decades legislation on the use of lead paint has existed in widely separated jurisdictions. In Maryland the State Legislature enacted chapter 517 of the Acts of 1949 making it compulsory to affix a label to any toy or to any children's furniture decorated with paint or other material containing lead or any other poisonous substance, stating clearly the poisonous nature of paint or decoration. This law was found to be unenforceable and a year later it was repealed. In the city of Baltimore on June 27, 1951, regulation No. 17 was adopted by the commissioner of health. It reads as follows: "*Interior Painting.* No paint shall be used for interior painting of any dwelling as dwelling unit or any part thereof unless the paint is free from any lead pigment". MARGARET H. WILTON

FORTHCOMING MEETINGS

CANADA

CANADIAN MEDICAL ASSOCIATION, Annual Meeting, Royal Alexandra Hotel, Winnipeg, Man. (Dr. T. C. Routley, 135 St. Clair Ave. W., Toronto, Ont.) June 15-19, 1953.

INTERNATIONAL PHYSIOLOGICAL CONGRESS, 19th Congress, Montreal, Canada (Dr. A. S. V. Burgen, McGill University, Montreal), September 1-5, 1953.

UNITED STATES

AMERICAN MEDICAL ASSOCIATION, Clinical Session, Denver, Colo. (Dr. George F. Lull, 535 N. Dearborn St., Chicago 10, Ill.) December 2-5, 1952.

THE RADIOLOGICAL SOCIETY OF NORTH AMERICA, 38th Annual Meeting, Hotel Netherland-Plaza, Cincinnati, Ohio (Dr. Donald S. Childs, Secretary-Treasurer, 713 E. Genesee St., Syracuse, 2, N.Y.) December 7-12, 1952.

AMERICAN ORTHOPSYCHIATRIC ASSOCIATION, 30th Annual Meeting, Hotel Statler, Cleveland, Ohio February 23-25, 1953.

AMERICAN HEART ASSOCIATION, 29th Annual Meeting and 26th Scientific Session, Hotel Chelsea, Atlantic City, N.J. (Dr. André Cournand, Chairman of Program Committee, c/o American Heart Association, 44 East 23rd Street, New York 10, N.Y.) April 8-12, 1953.

AMERICAN PSYCHOSOMATIC SOCIETY, 10th Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N.Y. (Dr. Sydney G. Margolin, Chairman, 551 Madison Ave., New York 22, N.Y.), May 2-3, 1953.

AMERICAN UROLOGICAL ASSOCIATION, Annual Meeting, Hotel Jefferson, St. Louis, Mo. (Dr. Charles H. Det. Shivers, Secretary, 215 Illinois Ave., Atlantic City, N.Y.), May 11-14, 1953.

AMERICAN MEDICAL ASSOCIATION, Annual Session, New York, N.Y. (Dr. George F. Lull, 535 N. Dearborn St., Chicago 10, Ill.), June 1-5, 1953.

INTERNATIONAL CONGRESS OF ELECTROENCEPHALOGRAPHY AND CLINICAL NEUROPHYSIOLOGY, Boston, Mass. (Dr. R. S. Schwab, Secretary-General, Mass. General Hospital, Boston 14, Mass.) August 18-21, 1953.

OTHER COUNTRIES

INTERNATIONAL STUDY CONFERENCE ON CHILD WELFARE, Bombay, India (All India Save the Children Committee, 5 Carmichael Road, Bombay, India) December 5-12, 1952.

INTERNATIONAL CONGRESS OF MILITARY MEDICINE AND PHARMACY, 14th Congress, Montevideo, Uruguay (Dèreccion General Del Service de Sanidad Militar. 8 de Octubre y Mariano Moreno, Montevideo, Uruguay) March 1-7, 1953.

INTERNATIONAL HOSPITAL CONGRESS, London, England. (Capt. J. E. Stone, Hon. Secretary, 10 Old Jewry, London, E.C.2, England) May 25-30, 1953.

INTERNATIONAL CONGRESS OF OTORHINOLARYNGOLOGY, Amsterdam, Holland (Dr. W. H. Stuben, J. J. Viottastraat 1, Amsterdam) June 8-15, 1953.

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PAN AMERICAN CONGRESS OF THE MEDICAL PRESS, Buenos Aires, Argentine (Secretaria del Congress, 763 Uriburu, Buenos Aires, Argentine) July 12-16, 1953.

INTERNATIONAL FEDERATION OF HOSPITALS, Congress, Brussels, Belgium (Capt. J. E. Stone, 10 Old Jewry, London, E.C.2, England) July 15-21, 1953.

INTERNATIONAL CONGRESS OF RADIOLOGY, 7th Congress, Copenhagen, Denmark (Prof. F. Nordgaard, 10 Oster Voldgade, Copenhagen K), July 19-25, 1953.

INTERNATIONAL CONGRESS ON MEDICAL LIBRARIANSHIP, First Congress, London, England (Mr. W. R. Le Fanu, Chairman, c/o London School of Hygiene and Tropical Medicine, Keppel St., London, W.C.1), July 20-25, 1953.

INTERNATIONAL CONGRESS FOR HISTORY OF SCIENCE, Jerusalem, Israel (Prof. F. S. Bodenheimer, President, Hebrew University, Jerusalem, Israel) August 3-7, 1953.

WORLD CONFERENCE ON MEDICAL EDUCATION, British Medical Association House, Tavistock Square, W.C.1, London, England (Dr. Louis H. Bauer, The World Medical Association, 2 East 103rd St., New York 29, N.Y.) August 24-29, 1953.

WORLD MEDICAL ASSOCIATION, 7th General Assembly, Amsterdam, Holland (Dr. Louis H. Bauer, 2 East 103rd St., New York 29, N.Y.) August 31-September 6, 1953.

NEWS ITEMS

NEWS OF THE MEDICAL SERVICES

Canadian Armed Forces

ROYAL CANADIAN NAVY

Surgeon Captain E. H. Lee, Medical Director General, R.C.N., attended the Medical Planning Conference at SHAPE in October 1952 and also visited Canadian Joint Staff, London.

ARMY

Lt.-Col. N. H. McNally, Major J. S. Hitsman and Capt. K. R. Schryer have returned to Canada after serving a tour of duty in Japan and Korea and Lt.-Col. E. H. Ainslee, C.D., and Captains L. St-Arnaud and K. J. O'Shaughnessy have been posted to the Far Eastern Theatre as replacement medical officers.

Lt.-Col. E. H. Ainslie, C.D., formerly Officer Commanding, Montreal Military Hospital, has been appointed Officer Commanding, Canadian Section, British Commonwealth Hospital, Kure, Japan, replacing Lt.-Col. N. H. McNally who has returned to Canada.

Lt.-Col. R. D. Barron, M.C., and Captains A. Lizotte and M. L. Brosnan have returned to Canada after serving a tour of duty in Germany and Lt.-Col. P. A. Costin and Captains W. J. Vail, C. R. Davidson, B. P. Brisson, P. S. DeGrosbois and H. C. Harley have been posted to the European Theatre as replacement medical officers.

Lt.-Col. P. A. Costin has been appointed Officer Commanding, 79th Field Ambulance, R.C.A.M.C., Germany, replacing Lt.-Col. R. D. Barron, M.C., who has been appointed Officer Commanding, Montreal Military Hospital.

Captain J. J. Glynn was recently appointed in the United Kingdom to a commission in the Canadian Army Active Force.

The retirement of Brigadier W. L. Coke, O.B.E., C.D., R.C.A.M.C., Director General of Medical Services, effective November 16, 1952, has been announced by Army Headquarters. Colonel K. A. Hunter, O.B.E., C.D., R.C.A.M.C., Deputy Director General of Medical Services, has been promoted to the rank of Brigadier and appointed Director General of Medical Services to succeed Brigadier Coke. Colonel J. N. B. Crawford, M.B.E., E.D., R.C.A.M.C., Senior Consultant to the Director General of Medical Services has been appointed Deputy Director General of Medical Services to succeed Colonel Hunter.

Lt.-Col. C. G. Wood, O.B.E., C.D., R.C.A.M.C., Command Medical Officer, Prairie Command, has been promoted to the rank of Colonel.

Lt.-Col. J. S. McCannel, O.B.E., R.C.A.M.C., Plans and Training Officer of the Director General of Medical Services Directorate, visited the United Kingdom and Western Europe in the early part of October 1952 to attend a SHAPE Medical Planning Conference in Paris and the DGAMS Annual Exercise "RUBICON" in the UK. Brigadier W. L. Coke, O.B.E., C.D., R.C.A.M.C., Director General of Military Services, Lt.-Col. R. D. Barron, M.C., Officer Commanding, 79th Field Ambulance, R.C.A.M.C., and Lt.-Col. J. W. B. Barr, also attended the DGAMS Exercise.

Brigadier W. L. Coke, O.B.E., C.D., R.C.A.M.C., Director General of Medical Services visited the Canadian Forces in Germany during October 1952 inspecting the medical arrangements for the 27 Canadian Infantry Brigade Group.

R.C.A.F.

Air Vice Marshal F. G. Wait, Air Member Personnel, R.C.A.F., and Air Commodore A. A. G. Corbet, Director of Medical Services (Air), R.C.A.F., attended the Advisory Medical Committee Meeting in Vancouver, B.C. October 11 and 12, 1952. The Meeting was under the Chairmanship of G/C A. W. Farmer, Consultant in Surgery to the R.C.A.F.

A meeting of all Command and Group Medical Officers along with Commanding Officers of Auxiliary Medical Units throughout Canada was held at the Institute of Aviation Medicine, R.C.A.F., Toronto, Ont., October 29 and 30, 1952.

Squadron Leader E. C. K. Purchase reported November 1, 1952 to the United States Army Latimer General Hospital, San Francisco, for one year postgraduate training in General Medicine.

ALBERTA

Dr. E. P. Scarlett of Calgary was inducted into the Chancellorship of University of Alberta October 31, 1952. In his high position as Chancellor for which he is well qualified we are aware that many good things are in store for our University as a whole.

Many candidates sat for the Royal College examinations held in Edmonton in October. These examinations for Fellowship and Certification standardize the men in their chosen branch of medicine. It is an old but tried custom followed, to prove that the Candidate has the knowledge in its fullest degree possible to carry on his or her work; the practical side has been usually attended to ere they come up for the examination.

Dr. Howard McEwen, Specialist in Internal Medicine, has opened offices in the Medical Dental Building in Calgary. Dr. McEwen was formerly associated with the Col. Belcher hospital in Calgary.

Dr. A. M. Carlisle of Grande Prairie was a visitor to the University hospital. The fine clinico-pathological conferences of Dr. John MacGregor at eleven o'clock Saturday mornings are worth a trip for any doctor.

The new maternity building of the Royal Alexandra hospital is near completion and will be a much needed structure in this fast growing city of Edmonton. Calgary, Lethbridge and other Alberta cities find it a necessity to increase their hospital facilities in recent months.

W. CARLETON WHITESIDE

BRITISH COLUMBIA

At the Annual Meeting of the Canadian Medical Association, B.C. Division, the decision was made to undertake a series of radio broadcasts at weekly intervals for 39 weeks a year. These would deal with all sorts of questions affecting the public relations of the medical profession, and would be prepared by professional radio experts. A sample broadcast was given at the meeting, and was most interesting.

The first of these was given from a Vancouver station CJOR in October 28. It was purely introductory, and will be followed in a week by one dealing with the operations and history of M.S.A., and its various aspects. This is an entirely new departure, as it is designed, not to give technical or medical information, but to explore the whole subject of public relations, and to present to the public our viewpoint, while attempting to obtain through request some of the opinions of the public and their problems. In this way, it is hoped, something will be done to remove much of the misunderstanding that so often exists between these two parties who are mutually interdependent.

The opening of the new buildings of the B.C. Cancer Institute in Vancouver, and the Refresher Course in Cancer which coincided with it, and lasted from October 6 to 10, were a most strikingly successful event. During this five days, there was a very full program of lectures, clinics, round table discussions, as well as public meetings, open house at the Institute, and a special Convocation at the University of British Columbia, at which honorary degrees were conferred on our two guest speakers from London, England, Sir Stanford Cade, and Professor B. W. Windeyer.

The refresher course was very well attended, and the lectures were excellent. There were over two hundred registered, and many who could only take in part of the course.

Dr. A. Maxwell Evans, Medical Director of the Institute, was in charge of the program, and has been working on it for a good many months. He has been receiving a good many congratulations on the very successful outcome of his hard work. All the staff of the Institute, from the President of the Foundation, Dr. G. F. Strong, down through the medical staff, and the management of the Institute, worked hard and loyally to contribute to the success of the program.

As part, and the most dramatic part, of the new equipment of the new buildings of the Institute, the new cobalt (60) bomb has been attracting attention. It is now in operation, and will be in constant use from now on.

The new Burnaby General Hospital was formally opened in October by the Hon. Eric Martin, Minister of Public Health for B.C., and two or three days were devoted to showing it to the public. It is at present designed to accommodate about 120 patients, but is so built that another 130 beds can be added without any further provision of heating and other facilities.

Later in the month a bylaw for $80,000 was submitted to the Burnaby voters, to complete the equipment of the hospital. This was passed by a considerable majority, and it will now be possible to open the hospital for the admission of patients. A hospital staff (medical) has been appointed, and it is hoped that the hospital will be operating before the end of the year, in fact November 3 we believe, has been chosen as the official opening date.

Miss Elinor Palliser, Superintendent of the Training School for Nurses of the Vancouver General Hospital, has just retired from this position, which she has held for the past nine years, and her loss is being keenly felt by doctors and nurses alike. Miss Palliser, who hails from Lachute, Quebec, and took her training at Johns Hopkins, has been a very successful superintendent and teacher of nurses. Her deep interest and concern for the welfare of those for whose training she has been responsible has always been her outstanding characteristic, and she has constantly fought for improvements in the conditions of training and housing of student nurses. She never rested till she secured adequate quarters for her nurses. When she came to the V.G.H. living conditions for nurses in training were little short of a menace to their health, and were overcrowded, and uncomfortable, to say the least. Her predecessors, too, had fought hard to improve matters, and their work undoubtedly paved the way for Miss Palliser, who finally secured a really modern and up-to-date nurses' home, which will accommodate comfortably over five hundred nurses, and is one of the finest things of its kind on the continent.

Dr. W. Donald Ross, a graduate in Medicine of Manitoba University, has been appointed Professor of Psychiatry at the University of British Columbia. He is coming on from Cincinnati University, where he went after working for some time at McGill.

At the first meeting of the Vancouver Medical Association for the year 1952-3, Drs. Gordon Burke and Dr. W. E. Ainley were elected to Life Membership in the Association—an honour most highly deserved by both these gentlemen.

Dr. Gordon Burke has been Treasurer of the Association for uncounted years, to the great and abiding benefit of that organization, and has filled many other positions whose outstanding characteristics were the need for hard work on the part of the incumbent.

Dr. (Bill) Ainley, who left McGill as M.D., C.M., somewhere about the year 1903 or 4, has long been the chairman of the Benevolent Fund Committee, which originated some twelve or more years ago. Ideologically, we believe, it was the offspring of the B.C. Medical Association; financially it was the responsibility for some years of the Vancouver Medical Association, and now, after many vicissitudes, it is administered under the control of the College of Physicians and Surgeons, through the Council of the College. But it is still, as it has been all through its various incarnations, the special care of Dr. Ainley, who has been reappointed the Chairman of the new Committee. He is particularly fitted for this work, in which he takes the keenest interest, through his possession of a kindly and generous nature, mixed with a wise discretion and common sense. He seemed extremely surprised at the fact that this honour should have been conferred, as he could see no reason why he should have received it.   J. H. MacDERMOT

MANITOBA

Dr. R. A. Macpherson, associate professor of radiology in the University of Manitoba, has been promoted to professor and chairman of the department. He succeeds Dr. Digby Wheeler who recently resigned. Dr. Macpherson came to Winnipeg in 1938 and was associated with the late Dr. J. C. McMillan. A native of Springhill, N.S., he graduated from Queen's University in 1929.

In connection with the annual meeting of the Manitoba Division, Canadian Medical Association, the General Practitioners Association of Manitoba held a dinner in the Royal Alexandra Hotel. Dr. V. F. Bachynsky of Winnipeg was elected president of the Association.

The corner stone of the $400,000 office building of Manitoba Medical Service being raised on Osborne Street North, Winnipeg, was laid on October 8, 1952.

Dr. and Mrs. G. A. B. Cowan and family have left Brandon Sanatorium for Saskatoon where Dr. Cowan will do cancer research work.

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Dr. Victor P. Zaitseff left the staff of Clearwater Lake Sanatorium in mid September to become an intern at St. Boniface hospital. He plans to write the Dominion Council examination in 1953.

Dr. W. F. Perry, associate professor in the department of physiology and medical research of the University of Manitoba, has been granted leave of absence for one year to continue his researches in the laboratory of Prof. F. G. Young in the University of Cambridge, England. He is a distinguished research worker in the field of endocrinology and pioneered in Canada in the use of radio-active materials to diagnose disorders of the thyroid. He was recently awarded the Ellmore Studentship to the University of Cambridge.

Dr. J. Nixon Briggs, late senior medical registrar, Sheffield Children's Hospital, has joined the staff of the Winnipeg Clinic for the practice of pædiatrics.

Dr. Dwight Parkinson has opened an office for the practice of neurosurgery at 513 Medical Arts Building, Winnipeg.

Dr. Ursula V. Quint, a graduate in medicine from Germany, March 1952, has joined the medical staff of Brandon Sanatorium. Previously she had been on the staff of the Winnipeg Municipal hospitals.

Dr. Mary J. McCann left Brandon Sanatorium on September 8 to return to Ireland. Before leaving she was presented with a gift at an informal tea in her honour.

The new Gimli Medical Centre was opened to the public on November 2. The members of the staff are Dr. Charles Scribner, Dr. Frank Scribner, Mrs. Margaret Sigimundson, R.N., Dr. A. B. Ingimundson, dentist, and Dr. George Johnson. The centre has four modern offices including consulting and examining rooms and a large waiting room.

Contrary to expectations the number of poliomyelitis cases has not diminished as yet. The outbreak began 18 weeks ago and up to October 30 there have been 23 deaths, 324 paralysis victims and 314 suspects, a total of 661. An eleven-month baby was recently brought to Children's Hospital, Winnipeg, from a small Manitoba town with paralysis of his throat muscles. He has undergone a tracheotomy and lies in an iron lung. The epidemic has thrown a great strain on the nurses and doctors in the hospitals where the poliomyelitis patients are being treated.

Lt.-Col. C. G. Wood, O.B.E., Winnipeg, command medical officer, Prairie Command, has been promoted to the rank of Colonel. He received his degree in science and medicine from the University of Manitoba and joined the permanent force as a lieutenant in 1935. He went overseas with one of the first Canadian contingents in the second World War and landed in Europe shortly after D-day. In 1950 he was appointed to his present post at Prairie Command. Ross MITCHELL

NEW BRUNSWICK

At the annual meeting of the N.B. Union of Municipalities, Dr. H. S. Wright, Mayor of Fredericton, was elected President of the Union for 1952-53.

At the 72nd annual meeting of the N.B. Medical Society, several matters of general interest were reported upon and discussed in general meeting. The Medical Care of Welfare group including persons on relief and in receipt of government allowances has been refused support by the N.B. Government as they felt the time was not opportune to assume responsibilities. The committee on economics was instructed to keep the problem under active consideration. The supply of doctors to sub-marginal districts is not the responsibility of the Medical Society. The society may help to interest physicians in practice in difficult areas but the financial support of such doctors devolves on the district with perhaps help from the provincial government.

The N.B. Medical Society will continue to press for improvement in remuneration and terms of service for physicians employed by the provincial Department of Health.

The N.B. Medical Society declared itself willing to participate in any scheme of the Trans Canada Medical Services which they may be able to negotiate on a national basis. Study of all proposals will be continued.

Dr. Euclide Rioux has been appointed Medical Health Officer for Restigouche and Madawaska counties.

In the Provincial elections in New Brunswick, Dr. E. J. Kennedy of Sussex was re-elected for another term. Dr. Kennedy has the longest continuous record as a sitting conservative member in the present legislature.

Dr. J. F. McInerney of Fredericton was elected and has since been appointed Minister of Health.

Hon. Dr. J. F. A. McGrand of Fredericton Junction, Minister of Health in the McNair Government was not re-elected.

Sponsored by the New Brunswick Medical Society and Dalhousie University, Dr. Morton Marks, Director of Physical Medicine and Rehabilitation Research, of New York Clinic and Bellevue Medical Centre, addressed extra mural meetings at Sussex, Fredericton, St. Stephen and Saint John. Subject: "Newer Concepts of the Patient with Chronic Disease".

The cornerstone of the new $700,000.00 Pathological Institute at the Saint John General Hospital was laid on October 22 by Mr. Clarence V. Emerson, Chairman of the Board of Hospital Commissioners. Hon. Dr. J. F. McInerney, Minister of Health for N.B., speaking for himself and for Premier Hugh John Fleming, congratulated the hospital board on the new addition to hospital facilities. The Federal Health Minister, Hon. Paul Martin, sent good wishes voiced by David A. Riley, M.P. for Saint John. The Bishop of Fredericton and the Bishop of Saint John were represented by Archdeacon Bate and Msgr. F. A. Cronin. A large representation of provincial physicians was present including Dr. J. A. Melanson and Dr. Austin Clarke of the Department of Health, Fredericton and Dr. A. L. Donovan, Chairman of the Medical Board of the Saint John General Hospital. Dr. R. A. H. MacKeen, the Director of the Bureau of Laboratories for the Province of New Brunswick, was perhaps the most interested spectator, as much of the planning of the new institute was done by him or under his supervision and it was under his direction that the work of the Provincial Laboratories has yearly increased in volume and value to the province to the point where this new building became essential to house the expanding services and necessary staff. A. S. KIRKLAND

NOVA SCOTIA

Dr. Clyde Holland who retired as Professor of Medicine at Dalhousie University this year due to ill-health is we are pleased to hear well on his way to a satisfactory recovery. Dr. Holland will retain his position as Clinical Professor of medicine.

Dr. Walter MacKenzie a graduate of Dalhousie Medical School 1932, now professor of surgery at University of Alberta was a guest lecturer at the annual meeting of the Nova Scotia Medical Society.

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Surg. Capt. Eric Lee, Command Medical Officer Atlantic Coast for the past 3 years left Halifax September 1 to take over the appointment as medical Director General Naval Services Royal Canadian Navy in Ottawa.

Dr. Frederick J. Barton, Surgeon with the Dartmouth Medical Centre successfully passed his fellowship examination in the American College of Surgeons.

Dr. Ralph Smith, Radiologist at Camp Hill Hospital, recently made a lecture tour of centres in Newfoundland. His trip was sponsored by the Dalhousie-Kellogg Post Graduate Fund.

Dr. John Fodden formerly associate professor of pathology, Dalhousie University began his new appointment as assistant professor of pathology, University of South Dakota, October 15.

Dr. A. E. Murray, and his family motored through the Canadian West and down the Pacific Coast during the past summer. They covered a total of 13,000 miles without mechanical trouble of any kind.

Dr. Carl Trask recently appointed Medical Superintendent of the St. John General Hospital spent several months at the Victoria General for a period of training.

Dr. R. M. MacDonald Associate Professor of Medicine Dalhousie University spent six weeks in Scotland this summer observing teaching methods in Medical Schools in that country.

Dr. Hugh Schwartz who retired as Professor of Otolaryngology at Dalhousie and this year is recovering satisfactorily from an attack of coronary thrombosis.

Dr. William Morse has recently returned from Montreal where he spent three months preparing for the Fellowship examinations.

Dr. H. G. Grant, Dean of Medicine, Dalhousie University recently attended the Annual Meeting of the Association of Canadian Medical Colleges and the Canadian Arthritic and Rheumatic Society.

Dr. Martin Hoffman, Research Professor of Medicine, Dalhousie University, has resigned his position effective September 1. The medical profession in the Maritimes sincerely regrets his departure as he has been a tower of strength to the University, the hospitals and the medical students. His excellent clinics, his lectures and his advice to all that sought it will be sorely missed.

Dr. Ernest Dowell has recently been appointed Professor of Oto-laryngology at Dalhousie University.

Dr. Fergie Little who has been seriously ill for the past three months is now at his home making slow but satisfactory progress.   C. M. HARLOW

ONTARIO

A successful post-graduate conference in tuberculosis was held at the Toronto Hospital for Tuberculosis, Weston, Ontario, from October 21 to 24, with fifty-two physicians enrolled from eight of the ten provinces in Canada. The speakers were drawn from the Medical Faculty of the University of Toronto, the staffs of neighbouring sanatoria, as well as the resident and consulting staff at this hospital. In addition, Dr. Hugh Burke from Montreal presented a paper during the conference and Dr. Carl Muschenheim of New York was guest speaker at the annual dinner of the Ontario Laennec Society on Friday, October 24.

The Canadian Cancer Society held its second Work Conference on October 30 and 31 at Toronto. This was sponsored by the Ontario Division and the Toronto Branch. It was arranged to further the Society's program of education, service and research. Among the speakers were Dr. Ivan Smith, Victoria Hospital, London, who spoke on "The Cobalt Bomb", Dr. Clarence Little, director of the Roscoe B. Jackson Memorial Laboratory, Bar Harbour, Me. and Mr. M. R. Runyon of the American Cancer Society.

The Little Red Door of Toronto, a drop-in centre for free cancer information, situated on Yonge Street just above Bloor reported 1,298 visitors in the past year and a half. Of these 72 were later proved to have cancer.

The work has now been extended by the Mobile Unit of the Little Red Door. A vehicle was purchased by members of the Landseair Club who wished to contribute to the Toronto Branch of the Canadian Cancer Society in memory of one of their members who died of cancer. This Mobile Little Red Door will tour the various cities and towns throughout Ontario. The registered nurse in charge will answer questions, point out the danger signals of cancer, distribute literature, allay fears and give authoritative advice as to the available doctors or medical centres where professional diagnosis may be obtained.

A federal grant of $373,000 to the Charles H. Best Institute of the University of Toronto has been announced by Hon. Paul Martin. The grant will be used to equip a new building that will have laboratories specifically for research on diabetes, growth hormones, the use of radioactive isotopes, and problems of physiology, histology and nutrition.

The College of Physicians and Surgeons of Ontario has granted $200 to each university in Ontario with an active medical faculty to assist in the purchase of books and journals so that any medical practitioner in Ontario may have the privilege of using books from the various medical libraries.

The American Diabetes Association is holding a postgraduate course in Diabetes in Toronto January 19, 20 and 21. Dr. Ray Farquharson and Dr. A. L. Chute are assisting the committee in making arrangements. The fee for members is $20 and for non-members $40.

Dr. Eileen Snow, principal of Ludhiana Medical College, Punjab, India was a recent guest of the Canadian Council of Churches. It is necessary to raise the teaching standards of her College, one of the two Christian medical colleges in India. For this purpose the Indian government has granted $500,000 and she is addressing meetings all over the North American continent in the endeavour to raise the other $500,000 in order to make a one million dollar addition to the college and hospital.

The Diabetic Association of Ontario has received a grant of $5,000 from the Atkinson Foundation to secure the services of a dietitian who will give counselling service to diabetics in various parts of Ontario. This dietitian will not prescribe diets but will interpret the doctor's prescription to the patient.

The Medical Alumni Association of the University of Toronto held its seventh annual graduate meeting on October 16 and 17. About forty-five speakers gave papers and took part in round table discussions. At the luncheon Dean MacFarlane said that a medical visitor wishing information and clinical instruction on any particular topic during a short visit to the city had only to notify the office of the dean and arrangements would be made to give this service, if at all possible.

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Grants from the John and Mary R. Markle Foundation have been received by Queen's and Western. Dr. J. D. Hatcher, former instructor in medicine, Boston University and a graduate of the University of Western Ontario is now working at Queen's.

Dr. A. Cameron Wallace, former instructor in pathology, Yale University and graduate of University of Western Ontario is back at his alma mater.

The purpose of the Markle Foundation is to relieve the shortage of medical teachers and investigators by providing academic security and financial assistance for faculty members early in their careers. Grants are made to the medical schools at the rate of $6,000 annually for five years and are earmarked for support of a specific scholar.   LILLIAN A. CHASE

QUEBEC

Dr. Fernand Montreuil, who had been practising in New York on the staff of the Presbyterian Hospital, has accepted the charge of chief of service of the Ear, Nose and Throat department of Notre Dame Hospital, Montreal.

Federal grants totalling more than $2,200,000 have just been approved for five more hospitals in Quebec—in Montreal, St. Joseph d'Alma, Chicoutimi and St. Johns.

The largest single grant—$1,380,231—goes toward the construction costs of the new St. Justine Hospital now being built on Cote Ste. Catherine Road, Montreal. When completed, this hospital will be one of the largest and most modern in Canada with 796 beds for patients, a 108-bassinet nursery, an extensive out-patient department, and a residence with accommodation for 347 nurses. It will have complete medical, surgical and obstetrical services, a pharmacy, laboratories, x-ray and physiotherapy services.

The St. Joan of Arc Hospital, also in Montreal, will receive $325,400 to assist with the costs of adding space for 285 beds, a community health centre and an 18-bed nurses' residence. The new construction, scheduled for completion next year, will also contain space for new operating rooms and laboratories.

At St. Joseph d'Alma a new 122-bed hospital is being erected by the Augustin sisters to serve the people of Lake St. John country. It will have a 38-bassinet nursery; modern medical, surgical and obstetrical services; and space for a community health centre. The federal grant toward the construction, scheduled for completion next year, will be approximately $158,800.

The Hotel-Dieu St. Vallier, Chicoutimi, is being enlarged by converting space formerly occupied by the staff into accommodation for additional patients, by adding a floor to the existing building and constructing a new wing. The additional space will provide accommodation for 192 more patients in the active treatment section; a 60-bassinet nursery; 54 beds for a neuropsychiatric department; a 44-bed residence for nurses; and a community health centre. The federal grant toward this work will be about $362,700.

The St. John Hospital, operated by the Grey nuns at St. Johns has also increased its bed capacity by converting staff quarters on the fifth floor into space for additional patients. The federal grant for this project is $10,000. This is the second federal grant for this hospital as more than $37,900 was provided in 1950 to help extend its accommodation.

SASKATCHEWAN

During this month the new Weyburn Union Hospital was officially opened. This institution is a 74 bed hospital and is perhaps one of the finest for its size of any hospital in Western Canada.

The building is of brick and is a very imposing appearance being situated at the North East end of the town near the junction of highways 13 and 39.

Bengough Union Hospital with a bed complement of 17 was officially opened at Bengough on October 22. It includes an addition to the patient beds and related facilities, a case room, operating room, nursery and suspect nursery, combined clinical laboratory and x-ray area, examining and consulting room, with the physician's office in the basement.

At Hodgeville their new Union Hospital was also opened. This organization with a rated capacity of eight beds has a service area of about 400 square miles and serves an estimated population of 2,125 people.

Its facilities include a combined case room and operating room, nursery and incubator, laboratory and x-ray facilities are also included.

The Saskatchewan Hospital Association held its annual meeting in Saskatoon at the Bessborough Hotel on October 8 and 9. A large group was in attendance and a successful meeting was held. This year a group of Saskatoon Medical men were in attendance in order that if and when medico-staff or medico-board relationships were under discussion the medical aspects of the problems could be better discussed and their viewpoints put forward.   G. W. PEACOCK

NEWS AND NOTES

[The Editor will be glad to consider any items of medical news or of lighter material that may be sent in for this column.]

HEALTH LEAGUES ROUND THE WORLD

(an editorial by Dr. Gordon Bates, General Director, Health League of Canada)

The Health League of Canada is a unique organization deserving an editorial at this time because of the attention it has attracted in other countries. Recently the World Health Organization announced that citizens' committees to promote health will be formed in the various countries associated with W.H.O. to assist in creating public opinion. The W.H.O. through its director has stated that the Health League of Canada is really the kind of organization needed and has invited the Health League to become the voluntary body representing the World Health Organization in this country.

The Health League of Canada is of value because it is a voluntary body and voluntary associations are essential in all continuing democracies if we are to escape the dreaded totalitarianism. Similarly the Health League of Canada represents no special interest. On its general council there are more than 60 nationally organized societies represented—medical and lay. This is a recognition of the fact that health is not only the business of the doctor and the health official but everybody's business. Laws for the promotion of health may be suggested by the doctor or the scientists but the force of public opinion is needed before they get on the statute books. We need look no farther than the fact that in Canada there are still eight provinces which lack province-wide compulsory pasteurization of milk. Every doctor knows that we should have such laws. Unfortunately to date public opinion (the opinion of the average citizen) has only been sufficiently organized in two provinces to result in government action.

But one cannot continue indefinitely in a mere editorial. We suggest that the Health League of Canada should be made as efficient as possible in Canada and that every effort should be made to create similar Leagues in other countries. A league to promote health may everywhere give publicity to the value of all voluntary movements with health as their objective and to the value of voluntary effort itself if we are to be continuing democracies.

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AN EYE FOR AN EYE

An Act of Parliament, now in operation, has made it possible for the dead to save the sight of the living in Britain.

This Act is known as the Corneal Grafting Act. Corneal grafting is the surgical operation by which a healthy cornea from one person's eye is grafted on to the infected or damaged eye of another.

The object of the Corneal Grafting Act is to facilitate the use of corneæ from the eyes of the dead. Under the Anatomy Act of 1832, it was doubtful whether such use could be made of dead persons' corneæ even if they had given their consent during their lifetime.

Under the new Act the cornea of a dead person may be used only if the person concerned has expressly so willed, or if the hospital authorities proposing to remove the dead person's eye are sure that neither he nor any relative would object. Anyone wishing his eyes to be used in this way after his death is accordingly now recommended to write and sign some such simple statement as, "I request that after my death my eyes be used for therapeutic purposes", and leave a copy of this statement with his relatives or executors. Alternatively, if anyone on his death-bed expresses the same wish in the presence of two witnesses, that will suffice.

CANADIAN DIABETIC ASSOCIATION

The formation of a Canadian Diabetic Association seems at last to be well under way. Last May a meeting was held in Ottawa under the chairmanship of Dr. C. H. Best and attended by a group all deeply interested in the problem of diabetes. Some were diabetics themselves.

The Department of National Health and Welfare showed its interest by providing the space for the meeting and Dr. Donald Cameron, the Deputy Minister, was at the meeting.

Dr. Best pointed out the success which had attended the Diabetic Association of Ontario as well as similar associations in many countries in helping the welfare of diabetics. He said there had been an expressed need for the formation in Canada of a National body to be concerned with the problems faced by diabetics in leading normal useful lives.

Dr. Cameron assured the group of the interest of the Government in such a proposed association. He pointed out that it should generate its own support and drive. The success of such a body depended on the local branches being strong, and the value of their work would have to be demonstrated, in order to obtain support.

It was abundantly shown how much work was waiting to be done for the diabetic. The following is an outline of the aims of the proposed organization.

1. To provide better educational facilities for diabetics in the form of public meetings, pamphlets and a journal devoted to the practical problems faced by a diabetic individual. To assist by scholarships physicians, dietitians, nurses, etc., interested in the problem of diabetes.

2. To secure better facilities for both patients and physicians in order that better diabetic management may be provided, e.g., wider provision of dieticians' services—more accessible and less expensive methods for checking blood sugar specimens.

3. To establish boarding facilities for diabetic children and adults with inadequate means, or for those requiring special training or treatment.

4. To establish summer camps for diabetic children, which besides providing recreational facilities, give opportunities for the adjustment of psychological problems as well as regulation of the diabetes.

5. To promote research in all fields of diabetes.

6. To aid in the detection of the unrecognized diabetic in order that early treatment may restore health and reduce the danger of complications.

7. To present as an organized group the problems of the diabetic community: (a) to the medical profession, (b) to the Government, (c) to the social agencies.

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TEXTBOOK OF SURGERY

Edited by H. F. Moseley, Assistant Professor of Surgery, McGill University. 896 pp., Illust. $15.75. C. V. Mosby Co., St. Louis; McAinsh & Co. Ltd., Toronto, 1952.

This book has been written by some twenty-eight members of the staff of the Royal Victoria Hospital in Montreal under the editorship of Dr. H. F. Moseley and the guidance of Professor G. Gavin Miller. It has been designed primarily for the undergraduate but contains much of interest and value to the recent graduate in the early years of surgical training, and to the practitioner. That training in operative technique should have almost no place in undergraduate education has been recognized at the outset, and one of the most commendable features of the book is that valuable space has not been devoted to operative techniques. The text is clear and concise and the illustrations are numerous and for the most part, excellent. As in most textbooks there are details with which the individual reader will disagree, but if the virtue of brevity is to be retained in such a book, too much variation of opinion cannot be included, and as a result, there is inevitably some local flavour.

This is an excellent text and may be recommended with enthusiasm to medical students.

GROUPING, TYPING AND BANKING OF BLOOD

O. J. Pollak, Director, Blood Bank, Chief, Departments of Anatomical, Clinical and Experimental Pathology. 163 pp. Illust. $7.00. Charles C. Thomas, Springfield, Ill.; The Ryerson Press, Toronto, 1951.

This book is intended to be mainly a handbook for blood bank personnel and as such provides definite instructions regarding the techniques of blood grouping and cross-matching. However, it also makes an attempt to appeal to a wider audience and discusses various administrative and medical problems which confront the transfusion officer or the physician who makes use of the blood bank. There is a rather detailed description of erythroblastosis fetalis and the technique of exchange transfusion. The various types of reaction to transfusion are also discussed in adequate detail.

The content of this book is accurate and up to date. It purports to be written in a simple, uncomplicated style, but one is not far into it before the jargon of the immuno-hæmatologist makes its appearance. It is unfortunate that many of these terms are not clearly defined anywhere in the book, a defect which might have been at least partially corrected by the inclusion of a glossary. There is much useful information here, although in some places it is extremely compressed and in others is set forth in almost irritating simplicity.

A PRACTICAL HANDBOOK OF MIDWIFERY AND GYNÆCOLOGY

W. F. T. Haultain, Hon. Consulting Obstetrician and Gynæcologist, Royal Infirmary, Edinburgh, and C. Kennedy, Assistant Obstetrician and Gynæcologist, Royal Infirmary, Edinburgh, including a section on the Management of the infant and neo-natal conditions by J. L. Henderson, Professor Child Health, St. Andrew's University. 412 pp. Illust. 4th ed. $4.60. E. & S. Livingstone Ltd., Edinburgh; The Macmillan Company of Canada, Ltd., 1952.

This book has for long been a popular standby for the final-year student preparing for his examinations. The authors give him, in a clear and easily remembered form, all he has to know. But for the busy practitioner, too, the book is a great help in looking up quickly information which he may need in his daily work. There are no lengthy passages to wade through; the facts are there, tabulated and enumerated in a concise and precise form.

(CONNAUGHT)

CORTICOTROPHIN
(ACTH)

In December 1949, at the invitation and with the financial support of the Federal and Provincial Governments, the Laboratories undertook to produce ACTH in Canada.

Specially collected pituitary glands were obtained across Canada through the helpful co-operation of the Canadian meat-packing industry. The facilities and staff of the Laboratories were applied to the development of methods of production and testing of ACTH, with the result that a product was prepared which met with favourable acceptance. Under the arrangements in effect during the initial period, supplies of ACTH were delivered to the National Research Council of Canada for distribution for research purposes by its Advisory Committee on ACTH and Cortisone.

In January of this year the Laboratories commenced distribution of ACTH direct to Canadian hospitals, physicians and research workers. The product was supplied as a stable, sterile powder, protein in nature and readily soluble in water or saline.

More recently, the Laboratories developed a stable aqueous solution of ACTH (Corticotrophin). This readily injectable form of the product, which is now available in addition to the freeze-dried material, has a potency of 20 International Units per cc. Both forms of the product are free from other pituitary hormones or harmful impurities in clinically significant amounts.

HOW SUPPLIED

Dry Powder   —   10 International Units per vial
              —   25 International Units per vial
Sterile Solution   —   20 International Units per cc.
(in 10-cc. vials)

> Amounts of ACTH have been expressed in terms of International Units, Provisional U.S.P. Units, and milligrams (of an original house-standard). These various units represent equal amounts of activity as assayed in rats by the ascorbic acid depletion method.

CONNAUGHT MEDICAL RESEARCH LABORATORIES
University of Toronto   **Toronto, Canada**

Established in 1914 for Public Service through Medical Research and the development of Products for Prevention or Treatment of Disease.

700 BOOK REVIEWS

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This new edition comprises some of the latest advances in treatment. Several sections have been entirely re-written as, for instance, those on Placenta Prævia, Delayed Labour, Venous Thrombosis and Dysmenorrhœa. The chapter on "Therapeutic Use of Hormones in Obstetrics and Gynæcology" enumerates the hormones in common use with their appropriate dosages and indications. The chapter on "The Infant", in which particular attention is given to infant feeding, and the section on "Venereal Diseases" have also been entirely re-written. A new short section on the Rh factor in Midwifery has been added. The authors have done justice to the fame of the Edin-burgh School and they are to be congratulated for putting the essential principles of modern obstetrics and gynæcology into so few pages. The book may be warmly recommended to final-year students and to general prac-titioners.

SIGNS AND SYMPTOMS

C. M. MacBryde, Associate Professor of Clinical Medicine, Washington University School of Medicine. 783 pp. Illust. 2nd ed. $11.00. J. B. Lippincott Company, Montreal, 1952.

Twenty-six prominent clinicians have contributed to this edition. There are new chapters on Pathologic Bleeding, Pigmentation of the Skin, Vertigo and Dizziness, and Clubbed Fingers and Hypertrophic Osteo-arthropathy.

The authors have tried to bridge the gap between text-books of Pathology, Physiology, Biochemistry and Patho-logic Physiology on the one hand, and those of Medicine and Therapeutics on the other. In each chapter a major sign or symptom is analyzed, and the mechanism of its production is discussed in the light of anatomical, patho-logical, physiological, chemical and psychological con-siderations.

Inevitably, the quality of individual chapters varies with the contributor. All, however, attempt to approach diagnosis in the same manner as the physician when he is confronted by a patient. The book is not an enumera-tion of differential diagnoses or an encyclopædia of signs and symptoms, but emphasis is laid on a discussion of the value of analyzing symptoms, with a view to interpreting them through the pathologic physiology of their origin. Of necessity, the discussion must be brief and is re-stricted to the interpretation of a symptom or sign. A list of relevant references follows each chapter for the con-venience of those, who may be interested in following up a problem by more extensive reading. This is a book which is of interest to the specialist and the general practitioner alike, and it contains much useful information.

DEVELOPMENTS IN DIPHTHERIA PROPHYLAXIS

L. B. Holt, The Wright-Fleming Institute of Microbiology, St. Mary's Hospital, London. 181 pp. Illust. $8.50. William Heinemann Medical Books Ltd., London; British Book Service (Canada) Ltd., Toronto, 1950.

The author of this book is a member of the Wright-Fleming Institute of Microbiology, St. Mary's Hospital, London, where for a number of years he has carried out studies on diphtheria toxoid. The book gives a summary of much of Holt's work in this field. One section is given over to a study of factors concerned in the preparation of diphtheria toxoid and deals with preparation of toxin, conditions required for the transformation of toxin into toxoid, purification of toxoid. Based on these studies there is a section in which details for the preparation of a satisfactory diphtheria prophylactic are set forth. Half the book is devoted to a study of various questions deal-ing with the enhanced antigenicity of alum precipitated toxoid and of toxoid absorbed on aluminum phosphate. The book is a most interesting document and it should be available to anyone concerned with the preparation or study of diphtheria toxoid.

There is at least one erroneous statement in the book. Holt says on page 68 that a false positive reading of the Schick test is excluded by injecting subcutaneously with the toxin, into another skin site, an identical amount of the same diluted toxin solution, but which has been heated to destroy the specific poison. The claim in this statement is not always true.

ELEMENTARY MEDICAL STATISTICS

D. Mainland, Professor of Medical Statistics, the Department of Preventive Medicine, New York University College of Medicine. 327 pp. Illust. $5.50. W. B. Saunders Company, Phila-delphia, London; McAinsh & Co. Ltd., Toronto, 1952.

This book strives to break down interdepartmental barriers between the various disciplines, and offers a set of principles by which scientifically valid conclusions can be drawn from experience. It will be helpful to those clinicians who are trying to set their observations on a sound basis.

"Statistics" implies different things to different people. Some even say that statistics can be made to prove anything. A clinical or laboratory teacher who says that in most cases "common sense" is a sufficient guide in dealing with figures, or that anything requiring statistical proof cannot have much practical significance, is out of step with modern trends. Medical statistics is gradually coming to mean "the principles of quantitative medi-cine".

It is difficult to think of anything in medicine that does not, directly or indirectly, depend on counting or measurement. This is obvious in research, but it is also true in diagnosis. When a surgeon, investigating a lump in a woman's breast, takes account of her age and family history, he is using quantitative data, *i.e.*, age incidence and family incidence of tumours. Even if he does not know the exact figures, he is making a proba-bility judgment, quantitative in nature, although not expressed numerically. Since medicine is so quantitative, it might be expected that practitioners also will take an increasing interest in statistics. Neglect of statistical methods in medicine has been due largely to the ab-sence of adequate training of medical students. Some medical schools are now trying to correct this situation and this book is designed primarily for students, the practitioners of the future; the principles and techniques described, however, are the same as those needed by all investigators, for they are common to all branches of medicine from histology to psychiatry.

Chapters I to VII will help students to develop an ability to evaluate what they read in medical journals and hear at medical meetings; provide basic methods of observation, analysis and reasoning necessary in learning from clinical experience; give instruction in some of the simpler statistical techniques (all the actual arithmetic of these could be mastered by a senior high school student in one or two hours); provide some knowledge of other techniques and terms, which practitioners are meeting more and more frequently in medical literature. Chapter VIII is mainly written for clinical investigators and research workers.

Some of the most striking advances of recent years, such as for instance penicillin treatment, were so different from previous experience, and produced such striking effects so rapidly, that there was no doubt regarding the interpretation of cause and effect. In the less spec-tacular advances of medicine one cannot help wishing, however, that the evidence on which the treatment was approved had been more carefully examined with the help of statistical methods. The objective of this book is to furnish not only medical students but also the man in practice with some of these principles and methods, which should be utilized in a sound investigation at the bedside or elsewhere.

The material presented is based on the author's teach-ing experience at Dalhousie University, and on lectures given at Yale and New York. The book is easy to read and general principles are well illustrated by practical examples.

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COLD INJURY

Transactions of the First Conference, June 4-5, 1951, New York, N.Y. Edited by M. I. Ferrer, Department of Medicine, College of Physicians and Surgeons, Columbia University, New York. 248 pp. Illust. $3.25. Josiah Macy Jr. Foundation, New York, 1952.

Since the end of the last war interest has turned from conditions of heat to a study of the response of the body to cold. In this first conference on cold injury, much of the discussion was based on experience gained in World War II and in the war in Korea. Many of the participants of the meeting had personal experience in Korea. The group included medical men from the armed forces as well as other research workers interested in this field.

Whereas practically no progress had been made between the two world wars with regard to the understanding of cold injuries, their prevention and treatment, much has been done in this field in recent years.

A good deal of the discussion was concerned with the question whether experiments in animals are applicable to regional cold injuries in man. Frostbite lesions in experimental animals are caused by rather rapid freezing of the exposed tissues, generally by immersion in a freezing mixture. It is, therefore, important to consider whether such experiments are applicable to the study of human frostbite. It is known that rapidly induced freezing injuries in man show no essential differences from those which develop more slowly. It was, therefore, felt that there is no essential difference between these two conditions; the acutely injured tissues to be essentially the same, and the sequelæ are also essentially the same. Experimentally produced lesions in animals are quite similar to those seen in man, and all grades of injury may be produced in the extremities, varying from the mildest changes in the proximal portion to gangrene in the more distal parts.

The information in these "Transactions of the First Conference on Cold Injury" will be found useful not only by military and civilian medical men, but also by individuals in the battle line, who may thus be spared some of the terrible results of faulty treatment which occurred during the last war.

CHILD PSYCHIATRIC TECHNIQUES

L. Bender, Professor of Clinical Psychiatry, New York University, College of Medicine. 335 pp. Illust. $10.25. Charles C. Thomas, Springfield, Ill.; The Ryerson Press, Toronto, 1952.

James G. Miller, Professor of Psychology, University of Chicago, said that "present developments in psychodiagnosis offer some of the excitement of fishing for trout, since the current of the stream of events in this field is flowing rapidly and there is much vigorous activity". The rapid appearance of more and more objective techniques would certainly appear to justify this view. Dr. Bender's book is a collection of papers written by herself, by Paul Schilder and a number of their associates at Bellevue Hospital during the past fifteen years. These papers deal with their experience in the care, treatment, observation and in many cases, the re-examination of thousands of children with problems. Techniques are described which were found useful in the understanding, diagnosis, and therapy of this large number of disturbed and unhappy children. From the multiplicity of problems met with in these children, Dr. Bender chooses to concentrate on a discussion of retardation in personality development, mental deficiency and regressive behaviour. Many children who were first observed when they were young, have been followed right through to young adulthood.

Among the various techniques now used in child psychiatry, emphasis is laid on the use of art: drawing, painting and clay modeling. The author's Gestalt test is fully discussed. An interesting contribution to present-day methods is to be found in the chapter on "Group Activities on a Children's Ward as Methods of Psychotherapy". Psychiatrists, psychologists, teachers, artists, and art teachers helped to make the observations, which have been evaluated and used to treat the children, and to develop the techniques described.

Those who have to deal with children will be interested in this latest work of Dr. Bender, who plans to follow it up with a volume on the psychopathology of childhood and, later, by a book on clinical psychiatric syndromes of childhood.

NUTRITION AND CLIMATIC STRESS

H. H. Mitchell, Professor of Animal Nutrition, University of Illinois and M. Edman, Research Assistant in Animal Nutrition in Charge of Literature Survey, University of Illinois. 234 pp. Illust. $8.00. Charles C. Thomas, Springfield, Illinois; The Ryerson Press, Toronto, 1951.

In the light of present world conditions this critical review of observations on the relationship between climatic stress and nutrition is of particular interest. Problems are dealt with from two angles: the effect of climatic stress on nutritional requirements and of food supply on tolerance to climatic stress; second, background information related to the impact of climate upon the general physiology of the body.

A discussion of the physiological effects of cold, the effect of cold on nutritional requirements, and the effect of diet on tolerance to cold, is followed by a description of the physiological effects of heat, the composition of human sweat and the rate of dermal loss of nutrients, the temperature of food and drink, solar radiation and air motion, and the effect of heat on nutritional requirements. The authors also deal with altitude as it affects diet. High-altitude flying, with its diminished atmospheric pressure, and in particular the low partial pressure of oxygen in the inspired air, is a climatic hazard for the preservation of physiological and psychological efficiency. This has necessitated much research in this field and the effect of altitude on metabolism, nutritional requirements, and of dietary modifications on tolerance to anoxia, are reviewed.

Although the material contained in this monograph was originally prepared for the U.S. armed forces, problems concerning the relationship between nutrition and climatic stress are of general scientific interest. Those interested in the question of how dietary modifications may improve man's comfort and efficiency under stress will find this little book worth reading.

A MANUAL FOR PSYCHIATRIC CASE STUDY

K. A. Menninger. 355 pp. $8.00. Grune & Stratton, New York; The Ryerson Press, Toronto, 1952.

This manual was prepared to meet the needs of doctors entering the field of psychiatry. But the author believes that psychiatry is not only a specialty; it is also a point of view in medicine, as it is impossible to make a sharp distinction between body and mind. He tries to build up a background for the mental attitude of any physician who is approached by a patient asking help. Respect for the dignity of the individual human being and reverence for the mystery of pain, impaired life and growth goes with awareness of the responsibility and authority of the physician, self-respect and respect for colleagues and predecessors, for accumulated medical knowledge, and for that quality in human beings that leads them to turn in trust to some of their equally fallible fellow creatures, to place their fate in the hands of physicians. From this general approach which applies to medical, surgical, obstetrical, dermatological and psychiatric patients, the author outlines the differences in the approach to the psychiatric patient, who himself differs from all other patients through the social stigmatization to which he is

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exposed. Consequently, our approach to the psychiatric patient must be different and the novice is advised how to proceed.

Treatment is discussed in four sections: the prescription of a therapeutic program; the record of treatment, development and complications; the nature and purpose of case summaries; the re-referral of a patient to the referring physician.

This is followed by chapters on "The Writing of Psychiatric Reports and Papers" and "Illustrative Case Records". Clear, explicit writing is indispensable for the psychiatrist, and Dr. Menninger, on the basis of a great number of clinical reports written by residents, makes some useful suggestions in this respect to young psychiatrists.

The author has been preparing and accumulating material for this book since 1919, and the resulting wealth of information may be warmly recommended to anyone who wishes to specialize in the field of mental disease.

OFFICE ENDOCRINOLOGY

R. B. Greenblatt, Professor of Endocrinology, Medical College of Georgia. 561 pp. Illust. 4th ed. $12.50. Charles C. Thomas, Springfield, Ill.; The Ryerson Press, Toronto, 1952.

This is a book which, through its edition, has become an almost indispensable part of every doctor's library. Whenever faced with a question concerning clinical endocrinology, one may turn to it with confidence and anticipate finding an answer. This fourth new edition has been almost entirely rewritten, and in the five years which have elapsed since the publication of the last edition, so much new information has been added to our knowledge in endocrinology, that the present volume has become almost a new book. The subject is dealt with from a clinical point of view, and the author, as before, writes from personal experience. This edition is primarily of value to the general practitioner, and has not been written for the specialist in endocrinology.

Some chapters of previous editions have been omitted, and about twenty new ones have been added. There are a few small errors, such as the omission of reference 7 on page 29, and the word "parasympathetic" instead of "sympathetic" on page 128; "mirabile dictu" on page 497 is misspelt.

The illustrations are excellent, and well above the average found in standard textbooks. The author commands a pleasant and readable style, which makes the book attractive as well as informative. His judicious selection of salient and important points from the maze of endocrinological literature gives the reader fundamentally sound information, which he can follow and apply with benefit in his clinical practice. Those who own a previous edition will not wish to miss the opportunity of renewing their association with an old friend, and others will not regret the acquaintance.

AN ATLAS OF GENERAL AFFECTIONS OF THE SKELETON

Sir T. Fairbank, Consulting Orthopædic Surgeon and Emeritus Lecturer in Orthopædic Surgery, King's College Hospital. 411 pp. Illust. $10.50. E. & S. Livingstone Ltd., Edinburgh; The Macmillan Company of Canada Ltd., Toronto, 1951.

This book of 411 pages and 510 illustrations is essentially a radiographic atlas of multiple lesions of the bones, but includes many accompanying photographs of the deformed subjects of the diseases and a few illustrations of the histology of the lesions. There are also useful tables of (1) the chemistry of the blood in various affections of the skeleton, (2) increased density affecting more than one bone, (3) collapse of one or more vertebral bodies, (4) multiple fractures more or less spontaneous, and (5) milkman's syndrome.

The publisher is to be commended for the excellence of the reproductions. His unusual and valuable collection of cases of skeletal lesions represents the accumulation of data over many years in the large orthopaedic practice. Some eighty conditions are described, illustrated, discussed and compared in 62 chapters.

The various diseases are presented in the order in which they appear in the following classifications: Congenital developmental errors; acquired affections of unknown origin; errors of diet and metabolism; endocrine errors; infections or toxæmias; errors of hæmopoietic and lymphatic systems; multiple neoplasms. The collection of cases is most remarkable in the first class, congenital developmental errors, concerning which there is so much confusion. The selection of excellent illustrations and the author's discussion clearly defines 22 different conditions. The multiplicity of terms used in naming skeletal affections has always been a source of confusion to the student. The author has wisely included synonymous names of those he chooses to use at the commencement of each chapter.

A limited but well selected list of references concludes each chapter and a good general and author index is provided. The author in his preparation of this book has not only presented a good atlas, but he has done it in a very orderly fashion, clearly defining each condition. The book, therefore, is an invaluable aid in the recognition and diagnosis of diseases affecting the skeleton generally and in multiple foci.

MENSTRUAL DISORDERS AND STERILITY

C. Mazer, formerly Associate Professor of Gynæcology and Obstetrics, Graduate School of Medicine, University of Pennsylvania, 3rd. ed., Revised. 583 pp. illust. $10.00. Paul B. Hoeber Inc., New York, 1951.

The first edition of this book was published in 1941. Five years later a second edition was necessary, because of the progress in our knowledge of menstrual disorders and sterility during that period. Now again, five years later a completely revised volume has been reproduced, for the same reasons. It is apparent that in a field of such rapidly changing knowledge, the present edition too, will soon be out of date. For those however, who cannot keep up with progress in this field by study of current literature, this book will be valuable.

In the preface to the first edition, the authors pointed out that this was a book written for the family practitioner. With this in mind, criticism can be levelled that the earlier chapters on anatomy and physiology are too detailed, and that therapeutic measures are far too numerous, and not sufficiently dogmatic to be of practical aid. In their effort to achieve completeness, the authors have overlooked the need by the practitioner for straightforward safe therapeutic measures, and advice as to when to refer patients who fail to respond, to those who have specialized in this field.

The section on sterility is clearly and fully presented with adequate illustrations. Office procedures are adequately discussed, and available methods of therapy clearly presented. This is the better portion of the book.

RX FOR MEDICAL WRITING

E. P. Jordan and W. C. Shepard. 112 pp. $2.75. W. B. Saunders Co., Philadelphia; McAinsh & Co. Ltd., Toronto, 1952.

This small book, a guide to good medical writing, is highly recommendable to all prospective authors. Its purpose is to help authors say what they mean and avoid faults which only too often prevent a paper doing justice to the work on which it is based. A rapid original writing of an article or book is recommended, to be followed by at least three thorough revisions. There are many practical suggestions with appropriate examples, including excellent chapters on illustrations and uses of statistics.

A TEXTBOOK OF ORTHOPÆDICS

M. B. Howorth, Clinical Professor of Orthopædic Surgery, New York University Post-Graduate Medical School. 1110 pp. illust. $17.00. W. B. Saunders Co. Philadelphia; McAinsh and Co. Ltd., Toronto, 1952.

As stated in the preface, the purpose of this book is "to provide the basic facts of the etiology, pathology, diagnosis and treatment of abnormalities and diseases of the musculo-skeletal system". Dr. Howorth accomplishes this aim with gratifying success, tracing as he does the knowledge necessary for intelligent orthopædic management through basic anatomy and physiology as applied to treatment, in considering the actual disease entities in the conventional way and in commenting on the rehabilitation period following successful treatment.

In the first section the basic principles, including the history of orthopædics, the anatomy and physiology required for orthopædic understanding, the general and orthopædic examination of patients leading to a diagnosis and finally the treatment, are dealt with. Such a general consideration of the anatomy and physiology is of questionable value in such a text but it may serve as a reminder; the section on orthopædic examination is extremely useful, containing as it does terms and methods unfamiliar to most general practitioners and students.

In the second section Dr. Howorth considers Regional Orthopædics as a study of the body as a whole (posture, gait, body build) and then by regions. The third section covers the orthopædic disorders; that is, disease entities with which the orthopædic surgeon is concerned. These second and third sections, then, are the conventional contents of orthopædic texts but, though brief, are characterized by clarity and completeness of coverage. The fourth and final section is a very useful and somewhat novel one, neurology in relation to orthopædic practice. Here, the neurologic disorders akin to orthopædic problems are discussed and the importance of psychogenic factors considered.

This is a laborious piece of work, the product of great experience in the practice and teaching of orthopædics, containing the conventional orthopædic facts together with new and useful sections on orthopædic examination and neurology, and written in a pleasantly readable style.

PHYSICAL MEDICINE IN GENERAL PRACTICE

Edited by W. Bierman and S. Licht. 798 pp. illust., 3rd ed., $12.50. Paul B. Hoeber, Inc., New York, 1952.

The new edition of this textbook continues to present physical medicine in all its aspects. It is well written and covers the most recent conditions such as ultrasonics as well as all the standard procedures. While there has been an increase in the number of contributors to this edition, the continuity of the book has not been interfered with. This book can be unhesitatingly recommended to all physicians interested in physical medicine. Bibliographies are supplied at the end of each chapter for those wishing a more exhaustive treatment of the various aspects of physical medicine. Physiotherapy technicians and occupational therapy technicians will also find this a very useful reference book.

PRACTICAL PROCEDURES

Edited by Sir H. Ogilvie and W. A. R. Thomson. 2nd ed. 380 pp. illust., 25/-. Eyre & Spottiswoode, Ltd., London, 1952.

Ten new chapters have been added to this edition. There are some very interesting chapters and much detailed explanation. All the chapters are written by authorities in the fields discussed. Many of the techniques discussed are peculiar to Great Britain; some of the illustrations are rather ancient. There is a great deal of valuable information contained in this book, but it is difficult to say how it could find much use as a reference book or a guide to the general practitioner on this side of the water.